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Volume III

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SUPERSONIC INLET INVESTIGATION

VOLUME III. WIND TUNNEL DATA REPORT

T.W. Tsukahira
W.F. Wong
B.G. Franco

Northrop Corporation
Aircraft Division

TECHNICAL REPORT AFFDL-TR-71-121, Volume III
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AFFDL-TR-71-121
Volume III

SUPERSONIC INLET INVESTIGATION

Volume III. Wind Tunnel Data Report

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W.F. Wong
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FOREWORD

This document was prepared by the Northrop Corporation, Aircraft Division, Hawthorne, California under USAF Contract No. F33615-69-C-1699, "Supersonic Inlet Investigation," Project No. 1476 "Airframe Propulsion Compatibility for Advanced Tactical and Strategic Aircraft." The report covers work performed from 1 May 1969 to 1 May 1971.

The program was administered by the Air Force Flight Dynamics Laboratory, Internal Aerodynamics Branch under the technical cognizance of Donald J. Stava, Project Monitor.

The contract effort conducted at Northrop Corporation, Aircraft Division was under the direction of G. R. Hall, Program Manager, and T. W. Tsukahira, Principal Investigator. Major contributions to this program were made by Messrs. N. F. Amin, B. G. Franco, P. M. Parmar, W. F. Wong, and M. Yamada.

Special acknowledgement is given to F. K. Hube, L. M. Jenke of the Von Karman Gas Dynamics Facility; R. W. Butler of the Propulsion Wind Tunnel; and others on the staff of ARO, Inc. and AEDC, Tullahoma, Tennessee.

The final report prepared under the contract consists of three volumes. The title of each volume is shown below.

Volume I. Supersonic Inlet Investigation - Summary Report

Volume II. Supersonic Inlet Investigation - Air Induction System Dynamic Simulation Model

Volume III. Supersonic Inlet Investigation - Wind Tunnel Data Report

This technical report has been reviewed and is approved.

Philip P. Antonatos

PHILIP P. ANTONATOS
Chief, Flight Mechanics Division
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ABSTRACT

Presented herein are wind tunnel data from an investigation whose primary objective was to develop design criteria and performance tradeoffs for supersonic inlets applicable to advanced tactical aircraft. The objective was accomplished by conducting analysis and wind tunnel tests using approximately .125 scale model air induction systems. The baseline models included a two-dimensional external compression inlet, a half-axisymmetric external compression inlet, and a two-dimensional mixed compression inlet. Alternate configurations for the external compression baseline inlets were also investigated. Tests were conducted at transonic and supersonic Mach numbers in the AEDC PWT-4T and VKF-A wind tunnels, respectively. The inlets were tested both isolated and in a well defined nonuniform flow field, the latter representing partial simulation of a vehicle flow field. Steady state performance data (i.e., pressure recovery, pressure distortion, and turbulence levels) are provided at a simulated compressor face and immediately downstream of the inlet throat for the various inlet configurations tested. Additional diagnostic data are provided in the way of surface pressures and boundary layer pressures on the inlet compression surfaces and in the subsonic diffusers.

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TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

SYMBOLS AND ABBREVIATIONS

The symbols and abbreviations listed below apply to Sections I through III of this report. It is noted that Section IV includes additional/alternate symbols and abbreviations which are defined separately within Section IV.

CPX	Distance from AX centerbody tip to cowl lip, inches
DEL2	2DE and 2DM second ramp angle relative to first ramp, degrees
DICF	Compressor face station distortion index, $\frac{(PT)_{max} - (PT)_{min}}{PTCF}$
DIR	Movable rake station distortion index, $\frac{(PT)_{max} - (PT)_{min}}{PTR}$
L	Subsonic diffuser length
M_o	Freestream Mach number
P	Static pressure, PSIA
PT	Total pressure, PSIA
PTO	Freestream total pressure, PSIA
PTCF	Compressor face average total pressure, PSIA
PTR	Movable rake station average total pressure, PSIA
R/R_o	Radial distance/diffuser radius, at AX movable rake station
R_{e_o}	Freestream unit Reynolds number, ft^{-1}
RMS	Root-mean-square dynamic pressure, PSI
RMSCF	Compressor face average root-mean-square dynamic pressure, PSI
RMSR	Movable rake station average root-mean-square dynamic pressure, PSI
T_o	Freestream total temperature, $^{\circ}R$
TBR	Throat bleed control area/maximum throat bleed control area
WBR	Ramp bleed mass flow, lb/sec
WBT	Throat bleed mass flow, lb/sec
WC	Inlet capture area mass flow, lb/sec
WCF	Compressor face mass flow, lb/sec
WO	Inlet mass flow, lb/sec
Z	2DE and 2DM movable rake location measured from diffuser ramp, inches
X	Model station measured from inlet throat, inches

α	Model angle of attack, degrees
β	Model angle of sideslip, degrees
ϕ	AX movable rake circumferential location measured from 12-o'clock position, degrees

Abbreviations

2DE	Two-dimensional external compression inlet
AX	Half-axisymmetric external compression inlet
2DM	Two-dimensional mixed compression inlet

SECTION I

INTRODUCTION

As a part of Contract F33615-69-C-1699, "Supersonic Inlet Investigation," shall scale inlet models were tested in the VKF-A Supersonic Wind Tunnel and the PWT-4T Transonic Wind Tunnel at the Arnold Engineering Development Center, Arnold Air Force Station, Tennessee. These tests were conducted in two test series, the first in April-June 1970 and the second in October-November 1970. A description of the test models, information relative to the test operation, and the resultant test data are presented in this report.

The objective of the test program was to obtain air induction system performance data applicable to the development of air induction systems for advanced tactical aircraft. In compliance with this objective, performance data were obtained for various small-scale air induction system models (approximately .125 scale) over a wide range of Mach numbers and angles of attack in both uniform and nonuniform approaching flow field.

The baseline models investigated included a two-dimensional external compression inlet (2DE), a half-axisymmetric external compression inlet (AX), and a two-dimensional mixed compression inlet (2DM). The design Mach number for the external compression inlets was $M_o = 2.5$ and the design Mach number for the mixed compression inlet was $M_o = 3.0$. Alternate configurations for the external compression inlets were also investigated.

The inlets were tested both isolated and in a well defined nonuniform flow field, the latter representing partial simulation of a vehicle flow field. Additional details of these tests are provided below:

1. Induction System Tests in Uniform Flow Field — Isolated inlet models were tested both transonically and supersonically. Nominal transonic Mach numbers were 0.6, 0.8 and 1.2, with angle of attack variations from -5 to 28 degrees. Transonic testing was limited to the external compression models.

Nominal supersonic Mach numbers were 1.5, 1.75, 2.0, 2.25, and 2.5 for the external compression models, and 1.5, 2.25, 2.5, and 3.0 for the mixed compression model. Angle of attack variations from -5 to 20 degrees were investigated at the supersonic Mach numbers.

2. Induction System Tests in Nonuniform Flow Field — Tests were conducted at supersonic Mach numbers with the inlet models in the expansion fan generated by a two-dimensional shock-expansion surface. Tests were limited to the baseline external compression models. Nominal Mach numbers were 1.75, 2.0, 2.25 and 2.50, with angle of attack variations to 15 degrees. Flow nonuniformities up to 20 percent variation in Mach number, and 12 degrees in flow angularity, were imposed across the projected face of the inlets.

SECTION II

MODEL INFORMATION

Model Description

The complete inlet test models consisted of a supersonic inlet section, subsonic diffuser section, flow control and metering section, and support mechanism. Auxiliary hardware included a flow field generator as a vehicle to test the inlet models in a non-uniform flow field.

Figures 1, 2, and 3 show details of the two-dimensional external compression inlet model (2DE), half-axisymmetric inlet model (AX), and two-dimensional mixed compression inlet model (2DM), respectively. Details of the metering section, which were common to each of the inlet/diffuser models, are shown in Figure 4. Figure 5 shows the subsonic diffuser area distributions for each of the baseline inlet models. Details of the flow field generator wedge are shown in Figure 6.

All of the inlet models were equipped for remote actuation of variable compression surfaces, inlet throat bleed flow and inlet mass flow. Each inlet model was also equipped with a remotely actuated total pressure rake located just downstream of the inlet throat section. These rakes were designed to survey the flow in the inlet throat region. During measurements of pressure profiles at the compressor face, the upstream rakes were stowed in a recess in the duct wall.

The model support mechanism consisted of a rectangular sting common to all of the inlet models and two separate adapter sections designed, respectively, to fit the support system of PWT-4T and VKF-A tunnels. The adapter section for each tunnel was designed to use the tunnel pitch mechanism for remote changes of angle of attack. In addition, the VKF adapter was provided with an initial 4-degree pitch offset to extend the model angle of attack range in the VKF tunnel to plus 20 degrees. Since neither of the tunnels had provisions for remote variation of sideslip angle, each adapter section was designed to allow the model to be rigged at sideslip angles of 0 and 4 degrees.

Two-Dimensional External Compression Inlet (2DE). Figure 1 shows details of the baseline 2DE inlet model and associated alternate configurations. The model is shown installed in the VKF-A tunnel in Figures 1a and 1b. The photographs were taken with the model in the airlock (which is part of the VKF-A automatic model injection system) beneath the tunnel.

Details of the 2DE baseline configuration (design $M_o = 2.5$) are shown in Figure 1c. The first compression ramp angle was fixed at 10 degrees. The position of the second ramp, remotely variable from -4 to 18 degrees (relative to the first ramp), was scheduled as a function of Mach number. The third ramp, which formed a part of the subsonic diffuser, was directly coupled to the motion of the second ramp.

A throat bleed slot was located between the second and third ramps, the width of the slot varying with ramp angle setting. The throat bleed flow could be regulated remotely and independently of slot width by adjustment of the bleed port area which was vented to the tunnel airstream. Boundary layer bleeds were provided on the second ramp and on an alternate side plate configuration by a series of 0.0625 inch diameter holes. The ramp bleed was metered by fixed area orifices located between the bleed chamber and the tunnel airstream. Sideplate bleeds were vented directly to the tunnel airstream.

The model was equipped with a remotely driven total pressure rake downstream of the throat. This rake, consisting of five steady state total pressure probes and two Kulite dynamic pressure transducers, was designed to survey the flow near the inlet throat. During measurements of pressure profiles at the compressor face, the upstream rake was stowed in a recess in the duct sidewall.

Several alternate cowls were provided to determine the effects of leading edge contour and cowl angle. These cowl configurations, along with the baseline cowl, are identified in Figure 1d. Cowl C5 was the baseline cowl. Cowl C7 was a blunted cowl and cowl C8, while maintaining the same lip contour as cowl C5, was reduced in angle from 20 degrees to 12 degrees. Cowl C10 represented the variable cowl inlet design of the baseline inlet which could be drooped for low speed high mass flow operation. This configuration was tested only in the transonic Mach number range.

As alternate configurations, two sets of vortex generators were provided to improve the performance characteristics of the subsonic diffuser. Details of these vortex generators are shown in Figure 1e.

Half-Axisymmetric External Compression Inlet (AX). Figure 2 shows details of the baseline AX inlet model and associated alternate configurations. The AX baseline configuration (design $M_0 = 2.5$) was a half-axisymmetric inlet with a translating centerbody. The model with the splitter plate centerbody configuration is shown installed in the VKF-A tunnel in Figure 2a.

Details of the AX baseline configuration are shown in Figure 2b. The translating centerbody was a double cone configuration with an 18 degree half-angle on the initial compression surface and a 30 degree half-angle on the second compression surface. A fixed bleed slot, extending over the circumference of the centerbody, was located at the inlet throat. The throat bleed flow could be regulated remotely by adjustment of the bleed port area, which was vented to the tunnel airstream.

The model was equipped with a remotely driven total pressure rake downstream of the throat in the annular diffuser section. This rake, consisting of five steady state total pressure probes and two Kulite dynamic pressure transducers, was designed to survey the flow by circumferential rotation about the centerbody. During measurements of pressure profiles at the compressor face, the upstream rake was stowed in a recess in the duct sidewall.

Details of an alternate half-axisymmetric inlet design, designated AX7, are also shown in Figure 2b. This model was designed for Mach 2.2 and featured a single fixed cone centerbody with a 25 degree half-angle compression surface and a 14-degree cowl angle.

Both the double cone baseline model and single cone alternate model were tested with a full 360 degree centerbody as the baseline centerbody. The half cone centerbody configurations, with and without splitter plates, were tested as alternate configurations. Details of the various centerbodies are shown in Figure 2c for the double cone configuration.

Alternate cowls were provided for the double cone baseline model to determine the effects of leading edge contour and cowl angle. These cowl configurations, along with the baseline cowl, are identified in Figure 2d. Cowl C1 (the baseline cowl) had a constant lip bluntness around the circumference. Cowl C2 was similar to Cowl C1, except for increased lip bluntness. Cowl C3 was designed with variable lip bluntness, with bluntness increasing around the circumference from top to bottom. The increased bluntness at the bottom was provided to minimize internal flow separation tendencies at angle of attack. Cowl C4, while maintaining the same lip contour as C1, was

reduced in angle from 20 degrees to 14 degrees. Cowl C4, in addition to serving as an alternate cowl for the double cone baseline model, served as the baseline cowl for the single cone compression surface model.

Two-Dimensional Mixed-Compression Inlet (2DM). Figure 3 shows details of the baseline 2DM inlet model. For this model, no alternate configurations were provided. Model variations were limited to investigation of alternate second ramp schedules and variation in throat bleed flow.

The 2DM model utilized many components in common with the 2DE inlet model. Changeover from the 2DE model to the 2DM model was accomplished by replacement of the two forward compression ramps (including the second ramp bleed system) and the forward cowl section, resulting in a configuration with partial internal compression. The 2DM model (design $M_o = 3.0$) was designed for mixed compression operation down to $M_o = 2.2$.

The 2DM model was designed with two external compression ramps and one internal compression ramp (Figure 3b). The first compression ramp was fixed at 10 degrees, with the second ramp remotely variable from 0 to 12 degrees (with respect to the first ramp) and scheduled with Mach number. The third compression surface (internal compression) was e internal surface of the cowl, fixed at 7 degrees with respect to the inlet horizontal reference plane. The inlet had boundary layer bleed from the second ramp, sideplates and cowl surfaces. A throat bleed slot, similar to that of the 2DE inlet, was located at the junction of the second compression ramp and diffuser ramp. All other model components were identical to the 2DE inlet model.

Metering Section. The metering section (Figure 4), common to each of the inlet diffuser models of Figures 1, 2, and 3, consisted of a simulated compressor face with instrumentation and a flow control and flow metering section. The simulated compressor face included a centerbody total pressure probe and six total pressure rakes, each rake containing five steady state pressure probes and one Kulite dynamic pressure transducer concentric to the middle steady state pressure probe between the centerbody and the duct wall. In addition, two steady state and two dynamic static pressure taps were located on the duct wall in the plane of the total pressure probes. A honeycomb section was located downstream of the simulated compressor face to represent acoustic blockage of the engine.

The inlet mass flow rate was controlled by a translating plug which formed an annular converging-diverging area designed for flow choking at low pressure ratios. The plug, which was designed to slide on a fixed shaft and positioned by a linear DC actuator, could be translated to vary and flow control area from approximately 4 to 14 in^2. A precision linear potentiometer was mounted on the plug actuator to indicate the plug position.

The flow rate through the metering section was determined from pretest calibrations (to be discussed later). These calibrations provided flow rate as a function of plug position and static pressure measured upstream of the plug. Although the metering section was calibrated for both choked and unchoked flow, the control area operated choked for practically all test conditions due to the convergent-divergent annular flow area.

Subsonic Diffuser. The subsonic diffuser area distributions for the baseline 2DE, AX and 2DM inlet models at the design Mach number are shown in Figure 5. The diffusers were designed to approximately maintain the scaled area and length relationships of the full scale diffusers, but did not include the offset contours required for integration into the full scale aircraft. Minor deviations in the scaled area and length relationships were required to maintain a degree of commonality of model components between the baseline inlet models.

The overall diffuser area ratio for the 2DE and AX inlet models was the same as a result of the common design Mach number of 2.5. However, the area distributions for these two inlet models are significantly different due to provision for the variable geometry requirements of the supersonic portion of the inlet. The diffuser of the 2DE inlet has a variable ramp with a pivot point at about half the length of the diffuser. This configuration results in a gradually increasing area distribution. On the other hand, the translating centerbody configuration of the AX inlet requires a relatively large increase in cowl area over a short linear distance to maintain the required inlet throat area as the centerbody is translated aft to the larger throat area positions. As a result, a rapid increase in diffuser area occurs when the centerbody is in the design Mach number position.

The 2DM inlet model utilized the same diffuser hardware as the 2DE inlet model. As a result, the area distribution is qualitatively like that of the 2DE, but with a higher overall area ratio due to the increase in design Mach number to 3.0.

All the diffusers were the same length. This length, in terms of compressor face diameters, was 6.5.

Flow Field Generator Wedge. A flow field generator, designed to generate an approximately linear two-dimensional flow field gradient, was used as a vehicle to test the inlet models in a nonuniform flow field. Figure 6 shows details of the flow field wedge. The wedge is shown installed in the VKF-A tunnel with the flow field calibration rake in Figure 6a.

The geometry of the wedge is shown in Figure 6b. The wedge consisted of an 8 degree compression surface at the leading edge, followed by a centered expansion Prandtl-Meyer contour ($M_o = 2.0$ design), and finally, a -8 degree straight trailing edge surface. The chord of the wedge was approximately 24 inches.

The wedge spanned the full width of the tunnel and was supported at the ends by a structure recessed into a steel window blank, the window blank forming a portion of the tunnel side wall. Vertical positioning of the wedge (up to 14 inches above the tunnel centerline) with respect to the inlet models was achieved by adjustment of lead screws (which restrain the wedge in the vertical plane) mounted in the window blanks at each end of the wedge. The wedge assembly was fixed in the horizontal plane. Horizontal positioning of the wedge with respect to the inlet models (up to 43 inches separation between the leading edge of the wedge and the leading edge of the inlet models) was achieved by fore-aft translation of the inlet models. Thus, by vertical adjustment of the wedge, along with horizontal translation of the model, preselected coordinates of the wedge with respect to the model to obtain given values of flow field nonuniformity were achieved.

Instrumentation

Each of the inlet models was instrumented for both steady state and fluctuating pressure measurements. This instrumentation included the various total pressure rakes shown in Figures 1 through 4, in addition to static pressure measurements made at various locations throughout the models. Additional pitot rakes were used to measure the nonuniform flow field generated by the flow field wedge.

The steady state and dynamic pressure instrumentation for the 2DE, AX and 2DM inlet models and compressor face-metering section is depicted in Figures 7, 8, and 9. Each steady state pressure orifice and dynamic pressure transducer is located

and numbered in these drawings. Tables II through VI supplement Figures 7 through 9 in providing additional instrumentation detail. The steady state pressures for the 2DE, AX, and 2DM models are identified in Tables II, III, and IV, respectively. The compressor face and metering section steady state pressures are identified in Table V, and the dynamic pressure instrumentation is identified in Table VI.

Steady State Pressures. Steady state pressure instrumentation for the inlet models included compression surface pressures, diffuser wall pressures, internal and external cowl pressures, translating rake pitot pressures, boundary layer rake pressures, compressor face pitot and static pressures, flow rate metering pressures, and throat and ramp bleed plenum pressures.

The compression surface pressures, diffuser wall pressures and internal and external cowl pressures were measured with flush static orifices mounted in line along the inlet vertical center plane for the 2DE and 2DM inlets (Figures 7 and 9), and in line along the inlet horizontal center plane for the AX inlet (Figure 8).

Details of the compressor face instrumentation are shown in Figure 10. The six rakes were spaced 60 degrees apart, with each probe positioned to measure the total pressure at the centroid of equal areas. Note that the middle probe of each rake is a dynamic pitot.

Static pressure orifices 134, 135, 136, and 137 (Figure 7), located 90 degrees apart in the flow metering section upstream of the mass flow plug, were calibrated as a function of the mass flow plug position to determine the inlet mass flow. The metering section was calibrated for both choked and unchoked flow. Pressure orifices 139, 140, and 143 were monitored to determine whether or not the metering section was choked.

Mass flow through the throat bleed system was determined with pressure measurements from orifice 200 located in the bleed plenum chamber of all the models. This pressure was calibrated as a function of throat bleed exit area in pretest calibrations. Likewise, mass flow through the ramp bleed system (2DE and 2DM inlets) was determined with pressure measurements from orifice 201.

Details of the total pressure rakes used in each of the models are shown in Figure 11. The individual probes of the movable rakes used in each of the models were located such that the rakes could be programmed to measure the total pressures at the centroid of equal areas as the rake was moved to survey the diffuser duct. That is, for the 2DE and 2DM inlets, the outside probes were located 1/10 of the duct width

or 0.275 inches from the diffuser side walls and the distance between probes was 0.55 inches. The AX movable rake probes, because of the three-dimensional effect, are closer together as the radial position is increased.

Steady state pressures (excluding the movable rakes) were measured in the VKF-A tunnel with 25-psid strain gage transducers mounted in three 48-port Scanivalves. The transducer-valve units were mounted outside the wind tunnel and connected to the model with 0.040 inch ID steel tubes. Pitot pressure measurements from the movable rakes were obtained with 15-psid transducers.

In the PWT-4T tunnel, all steady state pressures were measured with individual 15-psid transducers.

<u>Dynamic Pressure Measurements</u>. Locations of the dynamic pressure sensors are shown in Figures 7 through 11 along with the steady state instrumentation. This instrumentation consisted of six (6) total head dynamic probes and two (2) surface mounted static dynamic probes at the simulated compressor face station, one (1) total head probe at the compressor bullet nose, and two (2) total head dynamic probes and one (1) surface mounted static dynamic probe at the movable rake station within the diffuser.

Additional dynamic instrumentation included two reference sensors to measure the tunnel and instrumentation noise floor. A dynamic transducer was buried in the compressor face bullet nose section to measure the transducer response to mechanical vibrations as well as the electrical noise floor of the data acquisition system. A second dynamic transducer was mounted in the tunnel freestream to measure the tunnel noise floor. The higher of the two readings was considered as the noise floor of the inlet dynamic data.

All fluctuating pressure measurements were obtained with 0.08 inch diameter Kulite semiconductor transducers. Figure 12 shows the transducer installation for the model total pressure measurements. The transducers were mounted in pitot tubes with a slotted plate placed in front of the transducer face to protect it from particles. The corresponding local steady state total pressures were measured through a tube concentric to the transducer.

The transducer installation for measuring the freestream noise level was similar to that used to measure fluctuations in total pressure within the models (i.e., Figure 12), except that a cylindrical sleeve was added to the freestream probe to increase its

frontal area, thus insuring a clean, normal shock in front of the sensing area. The final outer diameter of the resulting freestream probe was 0.25 inch compared to an outer diameter of 0.125 inch for the compressor face probes.

Transducers for measurement of static pressures were mounted with the diaphragm flush to the diffuser duct surface without a protective plate. The corresponding steady state pressure was obtained from an adjacent orifice.

The output from the dynamic transducers was recorded on magnetic tape through a 14-channel frequency-modulated tape system. The root-mean-square (RMS) pressure level was measured at the same time and recorded with the steady state pressure data.

Flow Field Wedge. Auxiliary instrumentation associated with generation of the nonuniform flow field is shown in Figure 13. Figure 13a shows the flow field calibration rake. This rake was attached to the trailing edge of the wedge during flow field calibration tests performed prior to tests with inlet models in the wedge flow field. Since the flow field generated by the wedge is readily predictable, only one survey location was used. This survey was made to serve as a check of the analytically predicted flow fields by providing measured data on the distribution of Mach number across the expansion fans and data on the uniformity of the flow across the span of the wedge in the region of the inlet models.

The probes of the flow field calibration rakes are designed to measure total pressure (behind the locally normal shock immediately ahead of the probe tips). The relation of the probe O.D. (.125 inch) to I.D. (.069 inch) was such as to assure a normal shock upstream of the probe orifice for flow angles with respect to the probes within the range anticipated. Based on the measured freestream total pressure ahead of the wedge, the total pressure loss of the flow in passing through the wedge leading edge shock, and the measured total pressure by the flow field calibration rake probes, the local Mach number of the flow approaching the probes was readily obtained.

In addition to the flow field calibration rake, the wedge compression surface was instrumented with five static pressures as indicated in Figure 13a. These static pressures provided a check of the wedge alignment as well as the effect of any boundary layer buildup along the wedge which might change the effective angle of the wedge by displacing the external flow by the boundary layer displacement thickness (this effect was anticipated to be of the order of 0.1 degree). These static pressures were

monitored during the tests to assure proper alignment of the wedge throughout the test program.

Flow field rakes for the 2DE and AX inlet models are shown in Figures 13b and 13c, respectively. These rakes are shown attached to the inlet models with the probe tips aligned with the forward tip of the inlet compression surfaces, and with the rakes displaced 7.5 inches from the inlet centerlines. As such, they are designed to measure the flow field nonuniformity across the projected inlet face reference plane. The probe design and data evaluation techniques were similar to those for the flow field calibration rake discussed above. Note that the rake for the two-dimensional inlet has probes located along the spanwise direction as well as across the vertical reference plane.

Calibrations

Pretest calibrations of the model metering section, throat bleed systems, ramp bleed systems, and remotely actuated components were performed at Northrop Aerosciences Laboratory prior to shipment of the models to the AEDC Wind Tunnels. In addition, inlet model static tests were performed with each of the three baseline inlets to determine static performance of the models, provide pretest checkout of instrumentation, and determine the effects of compressor face pressure distortion, if any, on the metering section calibration. Dynamic pressure instrumentation was calibrated at both the VKF-A and PWT-4T wind tunnel facilities prior to and after testing.

Metering Section. With the entrance to the metering section (Figure 4) fitted with a bellmouth inlet and the exit connected to a suction system, the flow rate through the metering section was measured with a standard ASME orifice. Flow rate calibrations were performed with the bellmouth inlet exposed both to ambient pressure and to a 30 psia high pressure air source.

Measurements of compressor face pressures, metering section reference pressures, and flow rate were made over a range of pressure ratios across the metering section for various settings of the mass flow plug. The range of pressure ratios tested provided calibration at both choked and unchoked conditions (note that as a result of the converging-diverging area design of the mass flow plug, flow choking was achieved at pressure ratios across the metering section of less than 1.2).

Static testing with the inlet models coupled to the metering section provided calibration data on the effect of compressor face pressure distortion on the basic

metering section calibration. Based on these pretest calibrations, flow metering accuracy was determined to be ±2 percent, including the effects of compressor face pressure distortion.

Throat and Ramp Bleed Systems. Suction lines, containing flow metering instrumentation, were connected to the throat bleed outlets to calibrate the bleed flows as a function of bleed port area and pressure ratio across the bleed port area. Similar calibrations were made for the fixed area ramp bleed outlets.

Remotely Actuated Components. Voltage versus position calibrations were performed for each of the model position indicator potentiometers. Potentiometer range and limit switch location were checked, and adjusted as required, as a part of these calibrations. Included in these calibrations were: (1) compression ramp (cone) actuation system; (2) throat bleed port area; (3) translating throat rake; and (4) mass flow control plug.

Inlet Model Static Tests. Inlet model static tests were performed with each of the three baseline inlets to determine their static performance, provide pretest checkout of instrumentation, and determine the effects of compressor face pressure distortion, if any, on the metering section calibration. For these tests, the inlets were coupled to the metering section, with the exit of the metering section connected to a suction system. All internal steady state pressures were recorded during these tests to determine the diffuser pressure distribution and compressor face total pressure recovery and pressure distortion.

Tests were conducted both with and without a bellmouth entry to the inlets, the data with the bellmouth providing information on the performance of the subsonic diffuser and the data without the bellmouth providing information on the overall inlet performance at static conditions.

Dynamic Pressure Probes. The dynamic pressure instrumentation was calibrated for frequency response at both the VKF-A and PWT-4T wind tunnel facilities. Both calibration setups were similar in that the Kulite pressure probe assembly was exposed to discrete frequency sound waves of 140 db (reference .0002 microbar) amplitude. Each probe used in the test was calibrated over the frequency range 20-5000 Hz prior to installation in the model. All the dynamic probes used in the test showed less than a ±2 db variation over the calibrated frequency range.

Freestream noise levels were measured at M_o = 1.5, 2.0, 2.25, 2.5, and 3.0 in the VKF-A tunnel. The data were recorded with the model out of the stream since the sidewall mounted probe was located in an area aft of the model shock system with the model injected into the stream. The freestream RMS turbulence level normalized to the tunnel stagnation pressure is presented below for five Mach numbers.

TABLE I. VKF-A TUNNEL TURBULENCE

M_o	$Re_o \times 10^{-6}$	RMS/PTO $\times 10^2$
1.5	5.8	0.46
2.0	5.8	0.08
2.25	5.2	0.14
2.50	5.8	0.12
3.0	4.4	0.10

Due to mechanical problems with the probe designed for measuring the freestream turbulence in the PWT-4T tunnel, it was not possible to record this data directly. However, analysis of the turbulence data measured by the transducer buried in the model bullet nose, and an inspection of the trends of the turbulence data measured by all transducers, indicated the tunnel freestream noise level to be well below one percent of the tunnel total pressure.

TABLE II. 2DE INLET - STEADY STATE PRESSURE INSTRUMENTATION

Pressure Orifice Number	Model Station	Description	P_{static}	P_{total}
1	63.0	1st ramp surface pressure	X	
2	66.2			
3	68.5	2nd ramp surface pressure		
4	70.0			
5	70.4			
6	70.8			
7	71.2			
8	71.5			
9	72.0			
20	70.6	Diffuser lower wall pressure	X	
21	71.0			
22	71.6			
23	72.1			
24	72.6			
25	73.1			
26	74.1			
27	76.0			
28	78.8			
29	83.6			
40	72.6	Diffuser upper wall pressure	X	
41	73.1			
42	73.6			
43	74.1			
44	77.0			
45	79.8			
46	84.6			
47	92.6			
48	98.0			
50	80.0	Translating rake, .28 in		X
51		(measured from left, looking aft) .83 in		
52		1.38 in		
53		1.93 in		
54		2.48 in		
60	71.0	Lip external surface pressure	X	
61	71.2			
62	71.4			
63	71.7			
64	72.3			
65	72.8			
66	74.3			

TABLE II. Concluded

Pressure Orifice Number	Model Station	Description	P_{static}	P_{total}
70	68.5	Fwd. B.L. rake, second ramp .02 in		X
71		(measured from ramp) .05 in		
72		.10 in		
73		.15 in		
74		.25 in		
75		.40 in		
80	71.5	Aft BL rake, second ramp .02 in.		X
81		(measured from ramp) .05 in		
82		.10 in.		
83		.15 in.		
84		.25 in.		
85		.40 in.		
90	85.0	BL rake, diffuser .05 in.		X
91		(measured from ramp) .15 in.		
92		.30 in.		
93		.45 in.		
94		.65 in.		
95		1.00 in.		
200	74.0	Throat bleed plenum pressure		X
201	70.0	Ramp bleed plenum pressure		X

TABLE III. AX INLET - STEADY STATE PRESSURE INSTRUMENTATION

Pressure Orifice Number	Model Station	Description	P_{static}	P_{total}
1	68.2	1st cone surface pressure	X	
2	69.4			
3	70.4	2nd cone surface pressure		
4	70.7			
5	71.1			
6	71.4			
7	71.8			
8	72.0			
20	71.7	Diffuser outboard wall pressure	X	
21	72.2			
22	72.7			
23	73.2			
24	73.7			
25	74.8			
26	75.4			
27	76.6			
28	78.1			
29	80.4			
30	85.7			
31	92.8			
32	71.7	Diffuser lower wall pressure	X	
33	72.2			
34	72.7			
35	73.2			
36	73.7			
40	73.1	Diffuser inboard wall pressure	X	
41	73.6			
42	74.1			
43	75.0			
44	81.1			
45	83.0			
46	88.7			
48	98.0			
50	78.1	Sweep rake (closest to centerbody), r/R=.681		X
51		.770		
52		.848		
53		.915		
54		.976		

TABLE III. Concluded

Pressure Orifice Number	Model Station	Description	P_{static}	P_{total}
60	71.8	Lip external surface pressure	X	
61	72.0			
62	72.2			
63	72.5			
64	73.1			
65	73.7			
66	74.7			
70	70.0	Upper BL rake .02 in		X
71		(measured from centerbody) .05 in.		
72		.10 in.		
73		.15 in.		
74		.25 in.		
80	70.0	Lower BL rake .02 in.		X
81		(measured from centerbody) .05 in.		
82		.10 in.		
83		.15 in.		
84		.25 in.		
200	78.0	Throat bleed plenum pressure		X

TABLE IV. 2DM INLET - STEADY STATE PRESSURE INSTRUMENTATION

Pressure Orifice Number	Model Station	Description		P_{static}	P_{total}
1	58.9	1st ramp surface pressure		X	
2	62.8				
3	65.9	2nd ramp surface pressure			
4	68.0				
5	68.5				
6	69.0				
7	69.4				
8	69.8				
9	70.25				
10	70.55				
11	71.0				
20	68.55	Diffuser lower wall pressure		X	
21	69.55				
22	70.45				
24	72.2				
25	73.2				
26	74.4				
27	75.5				
28	79.4				
29	84.4				
40	73.3	Diffuser upper wall pressure		X	
41	73.8				
42	74.3				
43	74.8				
44	76.8				
45	79.8				
46	84.5				
47	92.4				
48	98.0				
50	80.0	Translating rake	.28 in		X
51		(measured from left, looking aft)	.83 in		
52			1.38 in		
53			1.43 in		
54			2.48 in		
60	71.0	Lip external surface pressure		X	
61	71.2				
62	71.4				
63	71.7				
64	72.3				
65	72.8				

TABLE IV. Concluded

Pressure Orifice Number	Model Station	Description		P_{static}	P_{total}
70	65.0	Fwd BL rake, second ramp	.02 in.		X
71		(measured from ramp)	.05 in.		
72			.10 in.		
73			.15 in.		
74			.25 in.		
75			.40 in.		
80	71.5	Aft B.L. rake, second ramp	.02 in.		X
81		(measured from ramp)	.05 in.		
83			.10 in.		
83			.15 in.		
84			.25 in.		
85			.40 in.		
90	85.0	B.L. rake, diffuser	.02 in.		X
91		(measured from ramp)	.05 in.		
92			.10 in.		
93			.15 in.		
94			.25 in.		
95			.40 in.		
200	74.0	Throat bleed plenum pressure			X
201	70.0	Ramp bleed plenum pressure			X

TABLE V. COMPRESSOR FACE AND METERING STATION - STEADY STATE PRESSURE INSTRUMENTATION

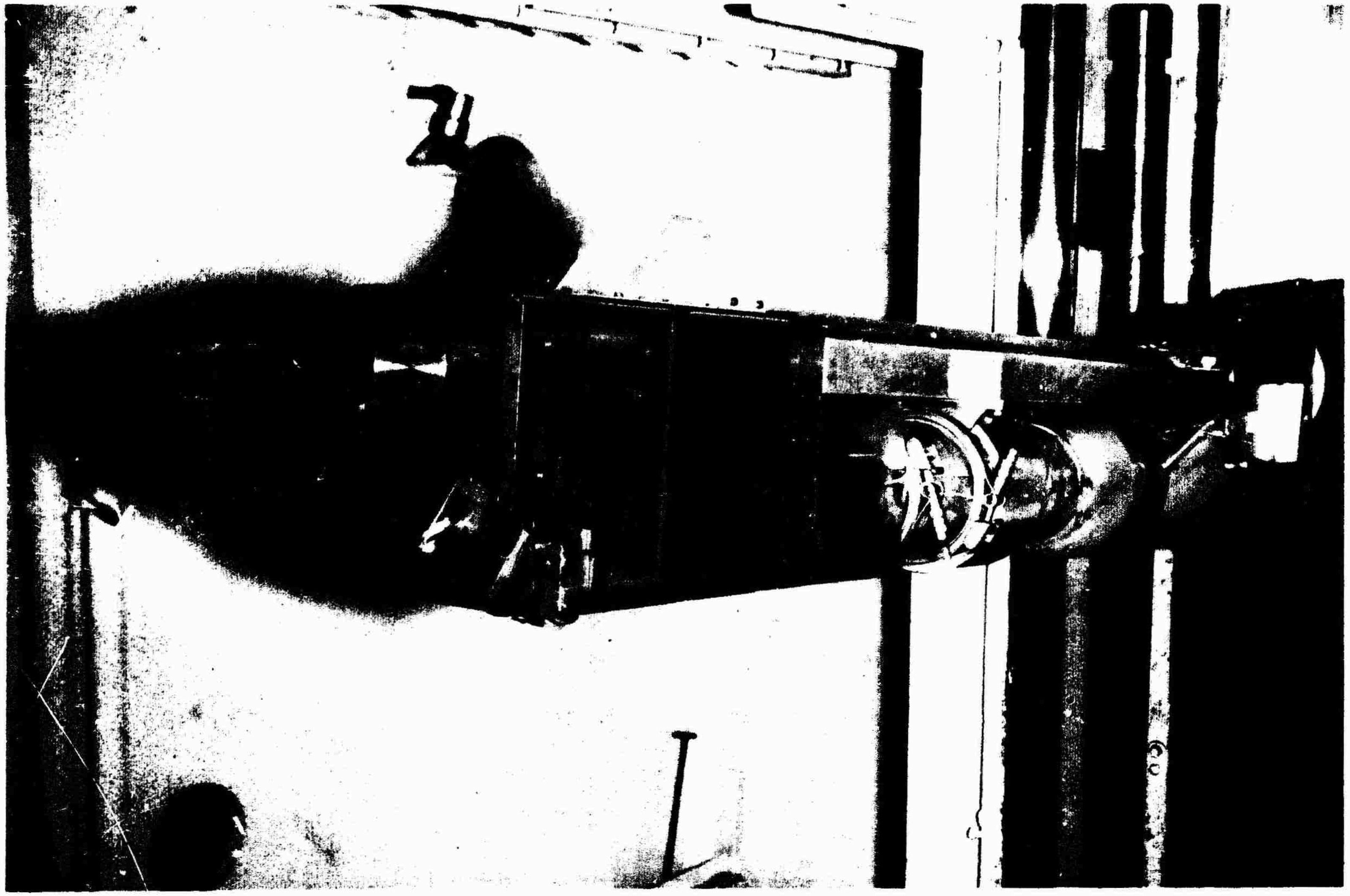
Pressure Orifice Number	Model Station	Description	P_{static}	P_{total}
100	98.9	Bullet nose total		X
101	100.0	Compressor face total, 0° rake, r/R = .9549		X
102		.8581		
103		.7488		
104		.6205		
105		.4577		
106	100.0	Compressor face total, 60° rake,r/R = .9549		X
107		.8581		
108		.7488		
109		.6205		
110		.4577		
111	100.0	Compressor face total, 120° rake,r/R = .9549		X
112		.8581		
113		.7488		
114		.6205		
115		.4577		
116	100.0	Compressor face total, 180° rake,r/R = .9549		X
117		.8581		
118		.7488		
119		.6205		
120		.4577		
121	100.0	Compressor face total, 240° rake,r/R = .9549		X
122		.8581		
123		.7488		
124		.6205		
125		.4577		
126	100.0	Compressor face total, 300° rake,r/R = .9549		X
127		.8581		
128		.7488		
129		.6205		
130		.4577		
131	100.0	Compressor face static, 0°, upper wall	X	
132		Compressor face static, 180°, lower wall		

TABLE V. Concluded

Pressure Orifice Number	Model Station	Description	P_{static}	P_{total}
135	105.2	Metering section pressure, (top), 0°	X	
136	↓	↓ 90°	↓	
137	↓	↓ 180°	↓	
138	↓	↓ 270°	↓	
139	108.3	Metering section throat pressure, upper wall	X	
140	108.5	↓	↓	
141	108.8	↓	↓	
142	109.1	↓	↓	
143	115.2	Metering section exit pressure	X	

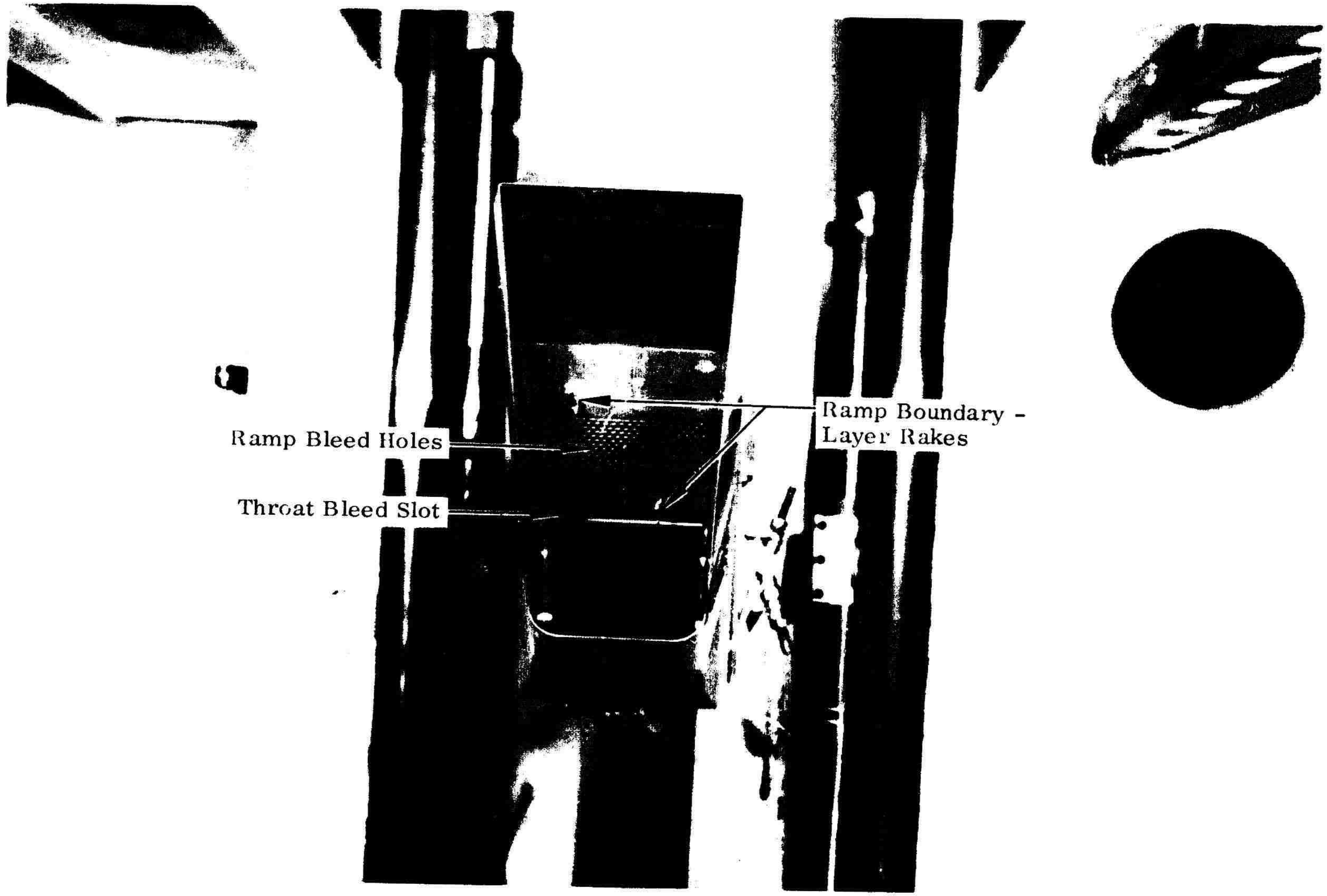
TABLE VI. DYNAMIC PRESSURE INSTRUMENTATION

Dynamic Pressure PD	Model Station	Description	Pressure Orifice Number (Steady State)
1	98.9	Bullet nose total pressure	100
2	100.0	Compressor face total, 0° rake	103
3		60° rake	108
4		120° rake	113
5		180° rake	118
6		240° rake	123
7		300° rake	128
8		Compressor face static, 0° top	131
9		180° bottom	132
10		Buried Transducer, bullet nose	
11	79.8	2-D inlet diffuser static	
11	76.6	AX inlet diffuser static	27
12	80.0	2-D inlet translating rake, left, looking aft	50
12	78.1	AX inlet translating rake, center	52
13	80.0	2-D inlet translating rake, center	52
13	78.1	AX inlet translating rake, outboard	54
14	-	Tunnel total pressure	



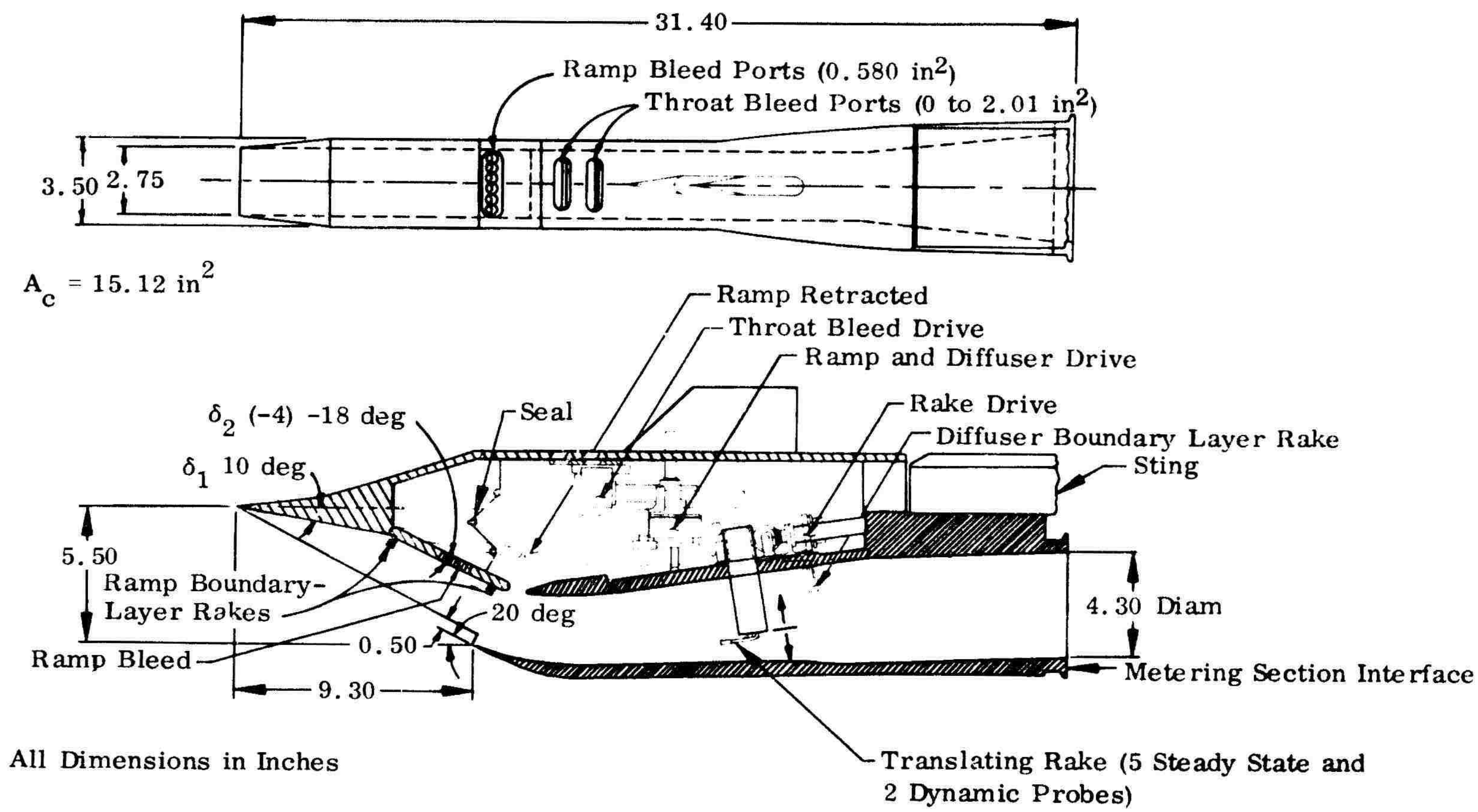
a. Installation Photograph, Side View

Figure 1. Two-Dimensional External-Compression Inlet (2DE) - $M_{design} = 2.5$



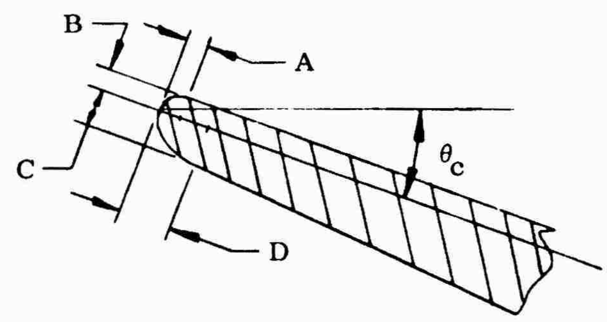
b. Installation Photograph, Front View

Figure 1 Continued

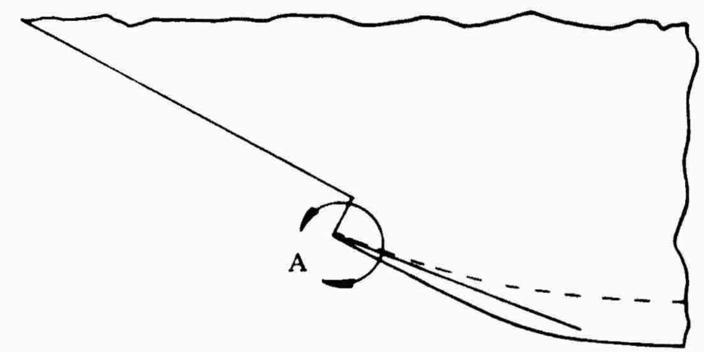


c. Inlet Details and Diffuser Details

Figure 1 Continued



View A

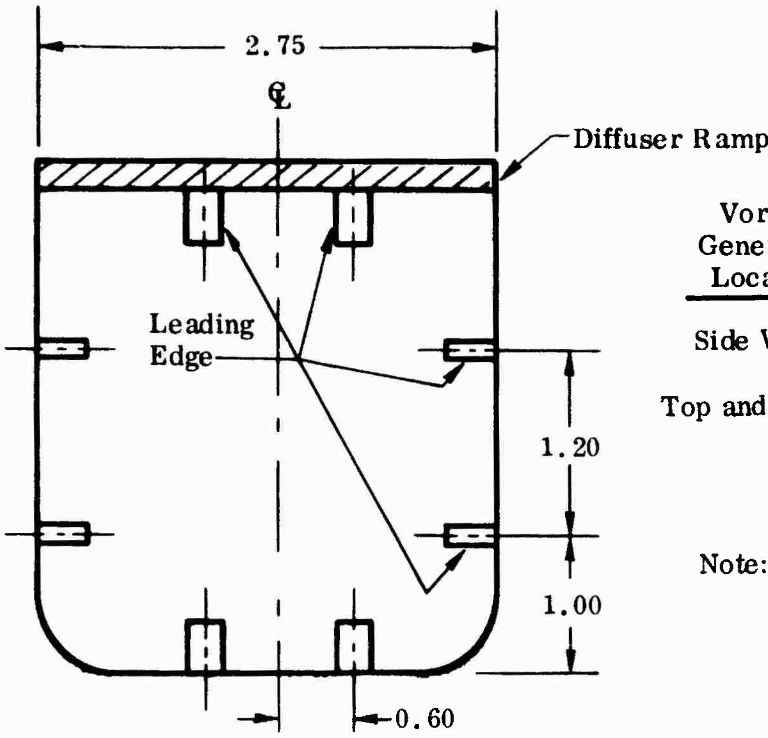


Cowl	θ_c, deg	Inside Contour	A, in.	B, in.	Outside Contour	C, in.	D, in.	A_c, in.^{2}
C5	20	Circular	0.016	0.016	Elliptical	0.031	0.063	15.02
C7	20	Elliptical	0.250	0.125	Elliptical	0.063	0.125	15.02
C8	14	Circular	0.016	0.016	Elliptical	0.031	0.063	15.02
C10*	5	Circular	0.016	0.016	Elliptical	0.031	0.063	16.05

*Represents baseline variable cowl inlet, C5, in "drooped" position for low speed operation.

d. Cowl Details

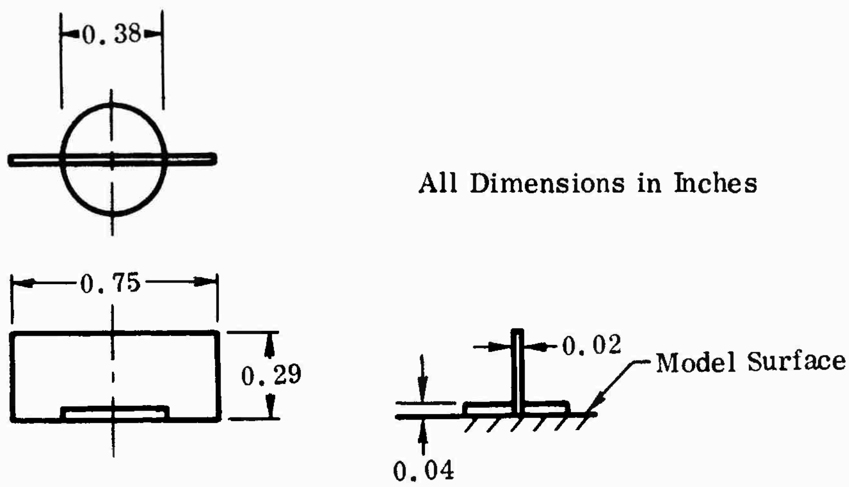
Figure 1 Continued



Vortex Generator Location	Leading-Edge Cant Angle
Side Walls	Down 10°
Top and Bottom	Toward ℄ 18°

Note: View looking aft, section shown with DEL2 = 17°

Vortex Generator Location - M.S. 75.5



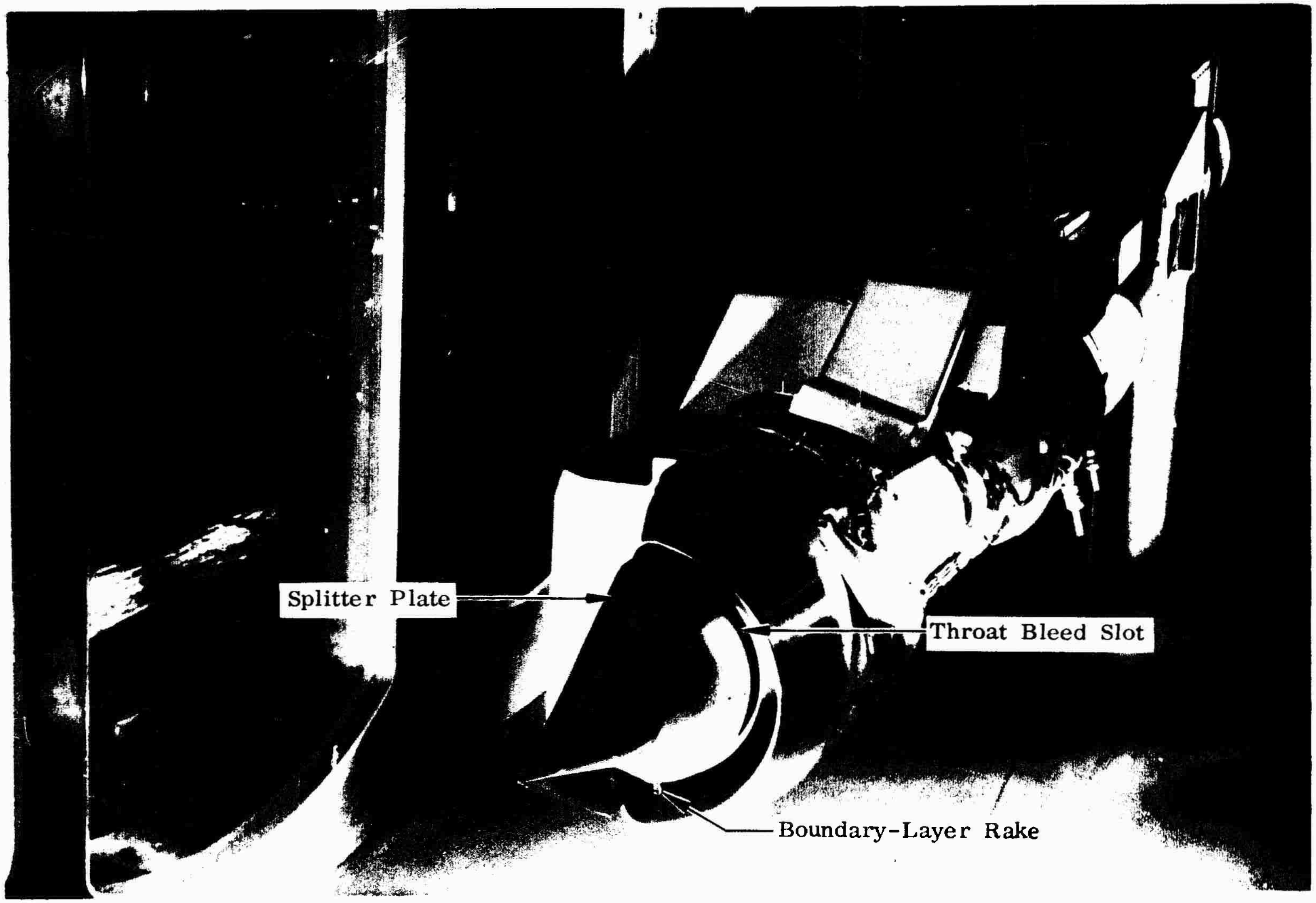
All Dimensions in Inches

Vortex Generator Details

Vortex Generator Configuration	Description
V	4 Pairs as shown
V1	1 Pair on Diffuser Ramp Only

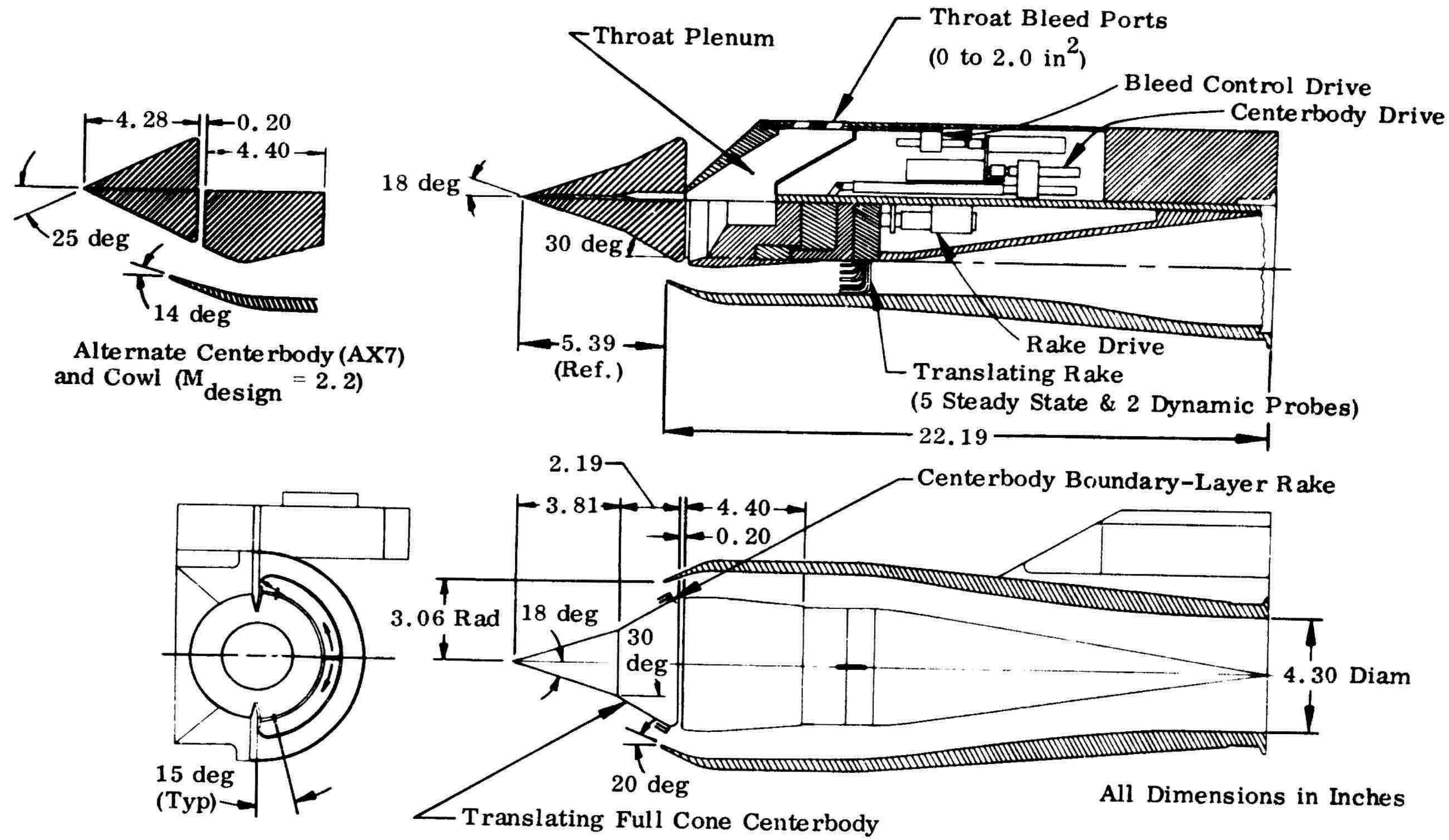
e. Vortex Generator Details

Figure 1 Concluded



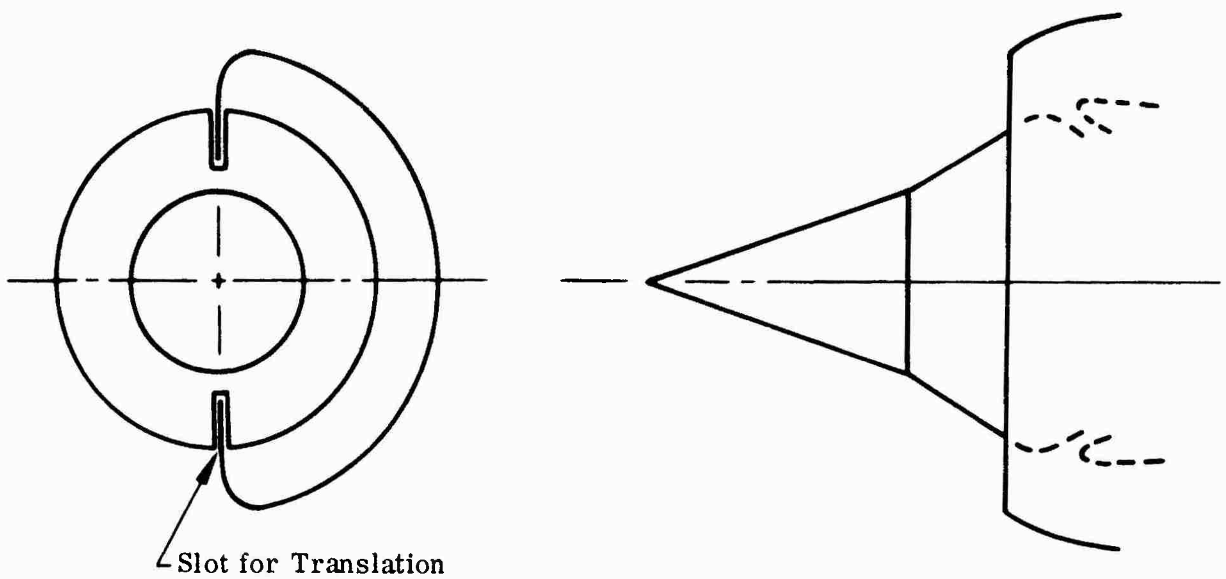
a. Installation Photograph

Figure 2. Half-Axisymmetric External-Compression Inlet (AX) - $M_{design} = 2.5$

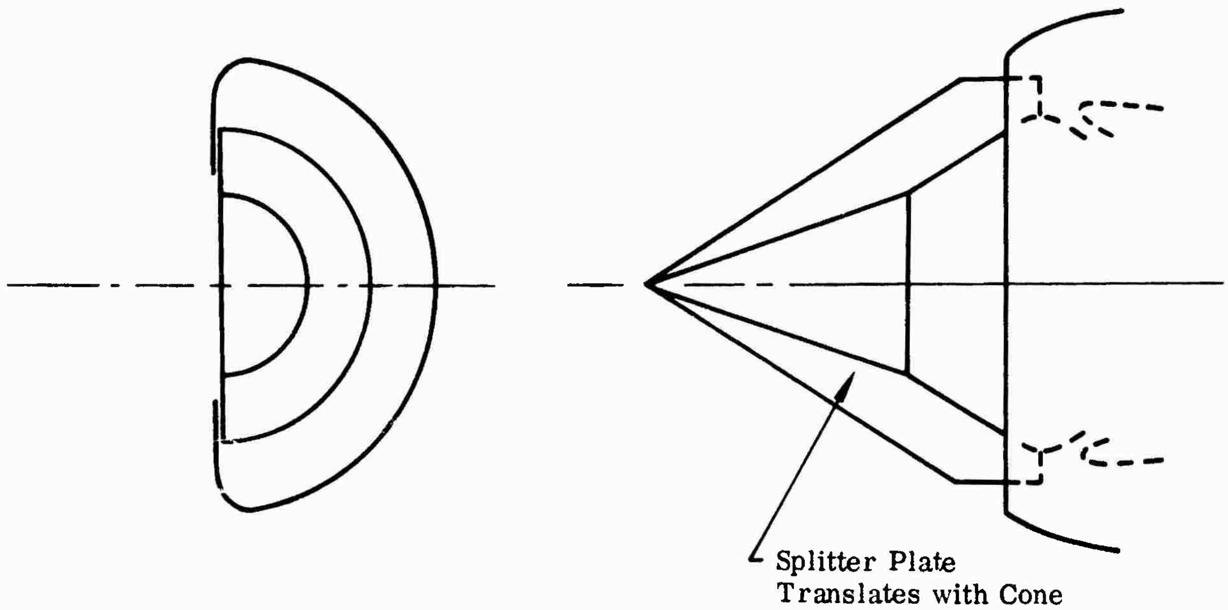


b. Inlet Details and Diffuser Details

Figure 2 Continued



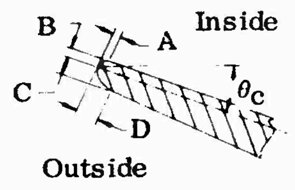
Full Cone Configuration (AXF)

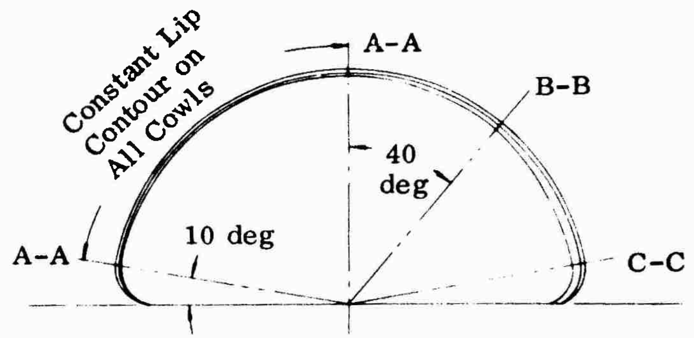


Half Cone Configurations:
(AXS) with Splitter Plate
(AXH) without Splitter Plate

c. Centerbody Configurations for Double Cone Compression Surface

Figure 2 Continued



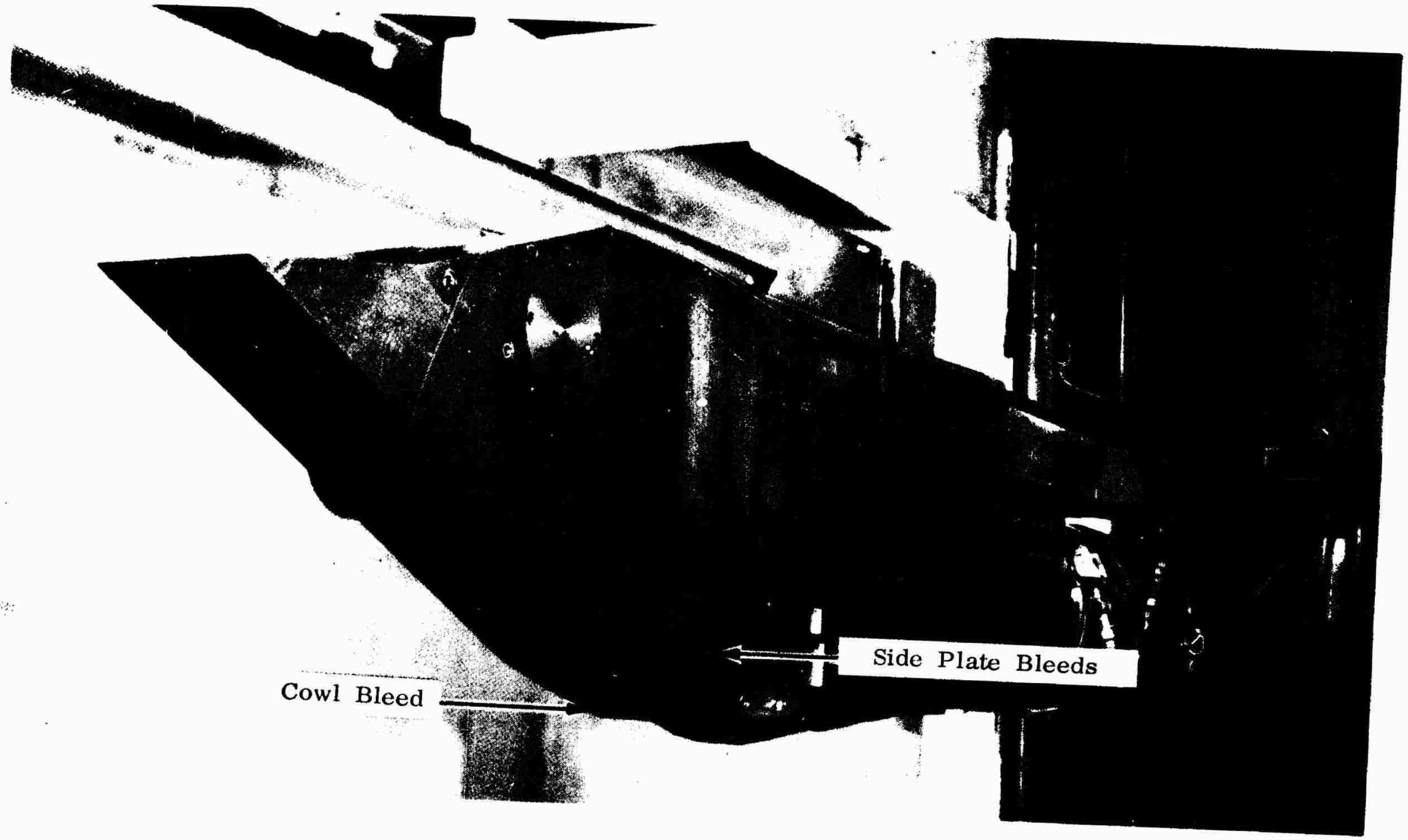


Cowl	θ_c, deg	Section	Inside Contour	A, in	B, in	Outside Contour	C, in	D, in	A_c, in^2
C1	20	A-A to C-C	Circular	0.016	0.016	Elliptical	0.031	0.063	14.68
C2	20	A-A to C-C	Circular	0.031	0.031	Elliptical	0.063	0.125	14.68
C3*	20	A-A	Circular	0.031	0.031	Elliptical	0.063	0.125	14.68
	20	B-B	Elliptical	0.125	0.070	Elliptical	0.063	0.125	14.68
	20	C-C	Elliptical	0.250	0.115	Elliptical	0.063	0.125	14.68
C4	14	A-A to C-C	Circular	0.016	0.016	Elliptical	0.031	0.063	14.68

* Outside contour varies between sections A-A and C-C

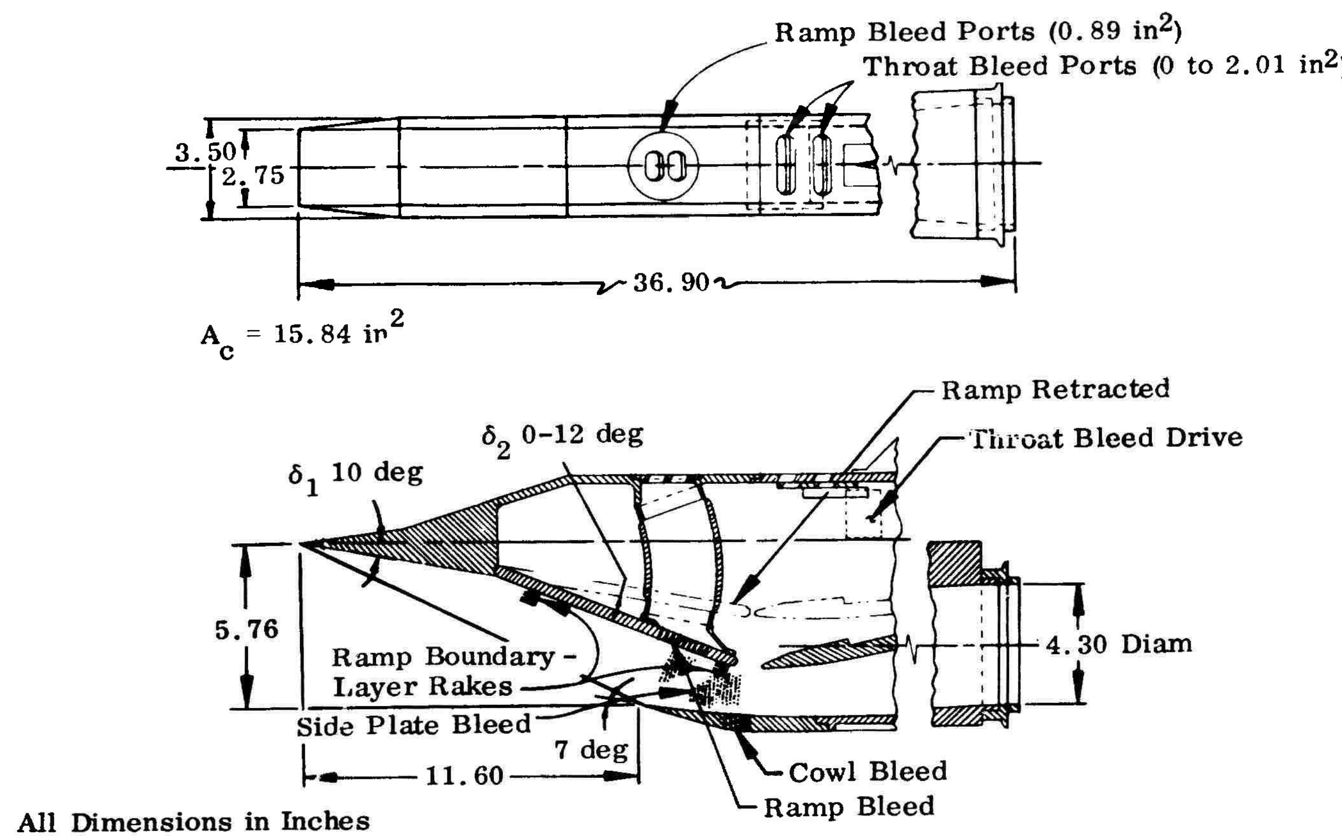
d. Cowl Details

Figure 2 Concluded



a. Installation Photograph

Figure 3. Two-Dimensional Mixed-Compression Inlet (2DM) - $M_{design} = 3.0$



b. Inlet Details

Figure 3 Concluded

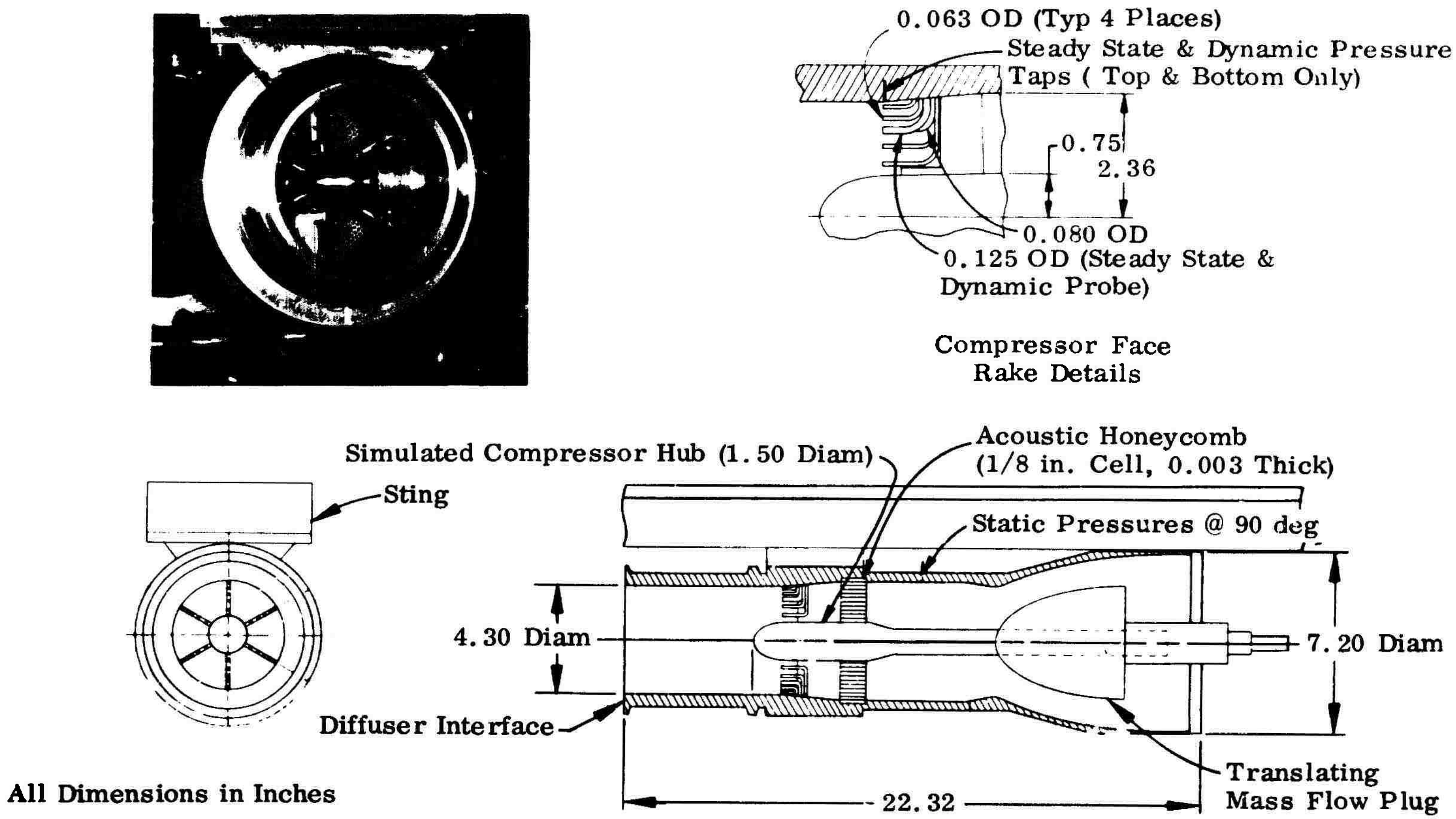
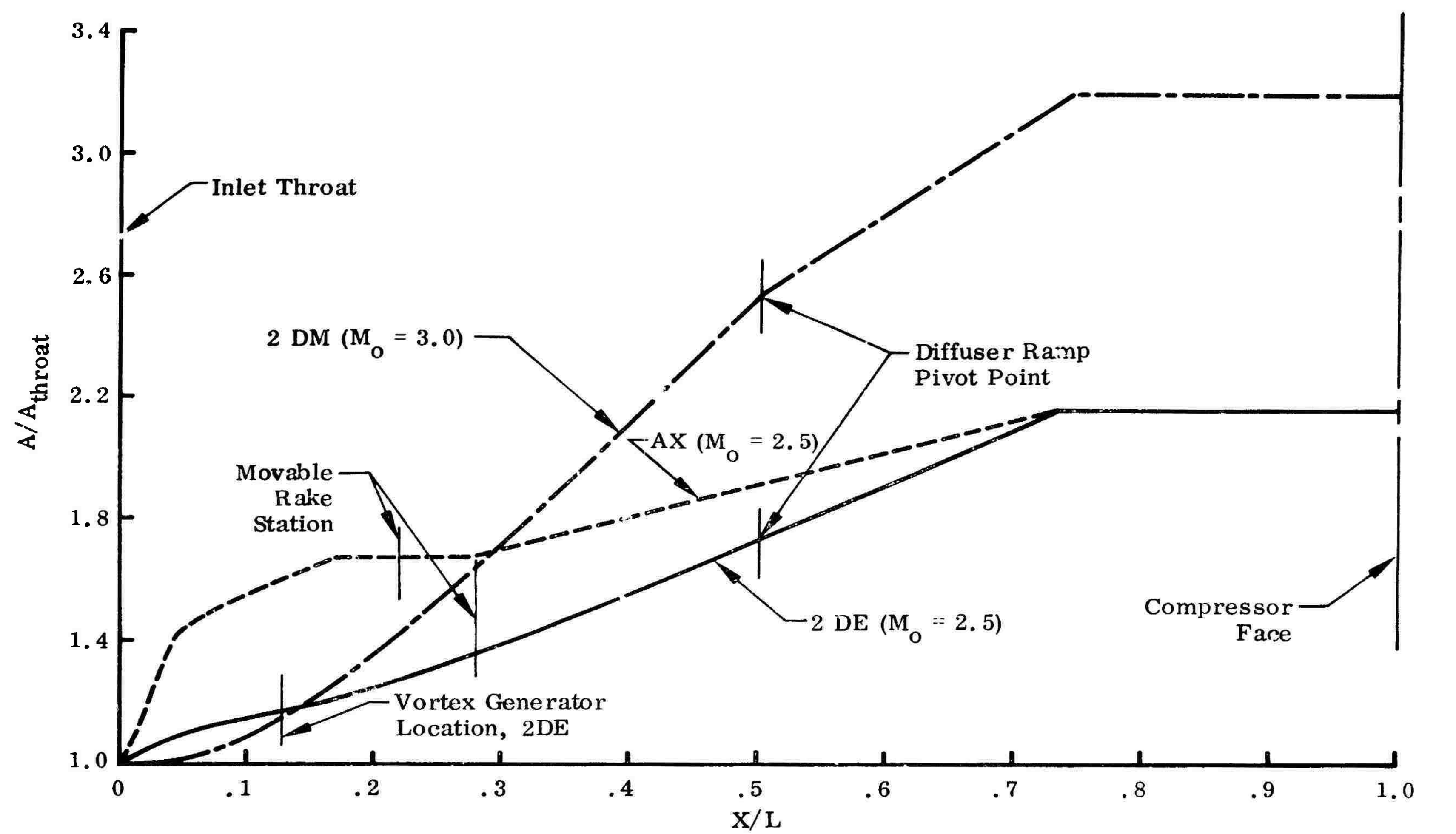
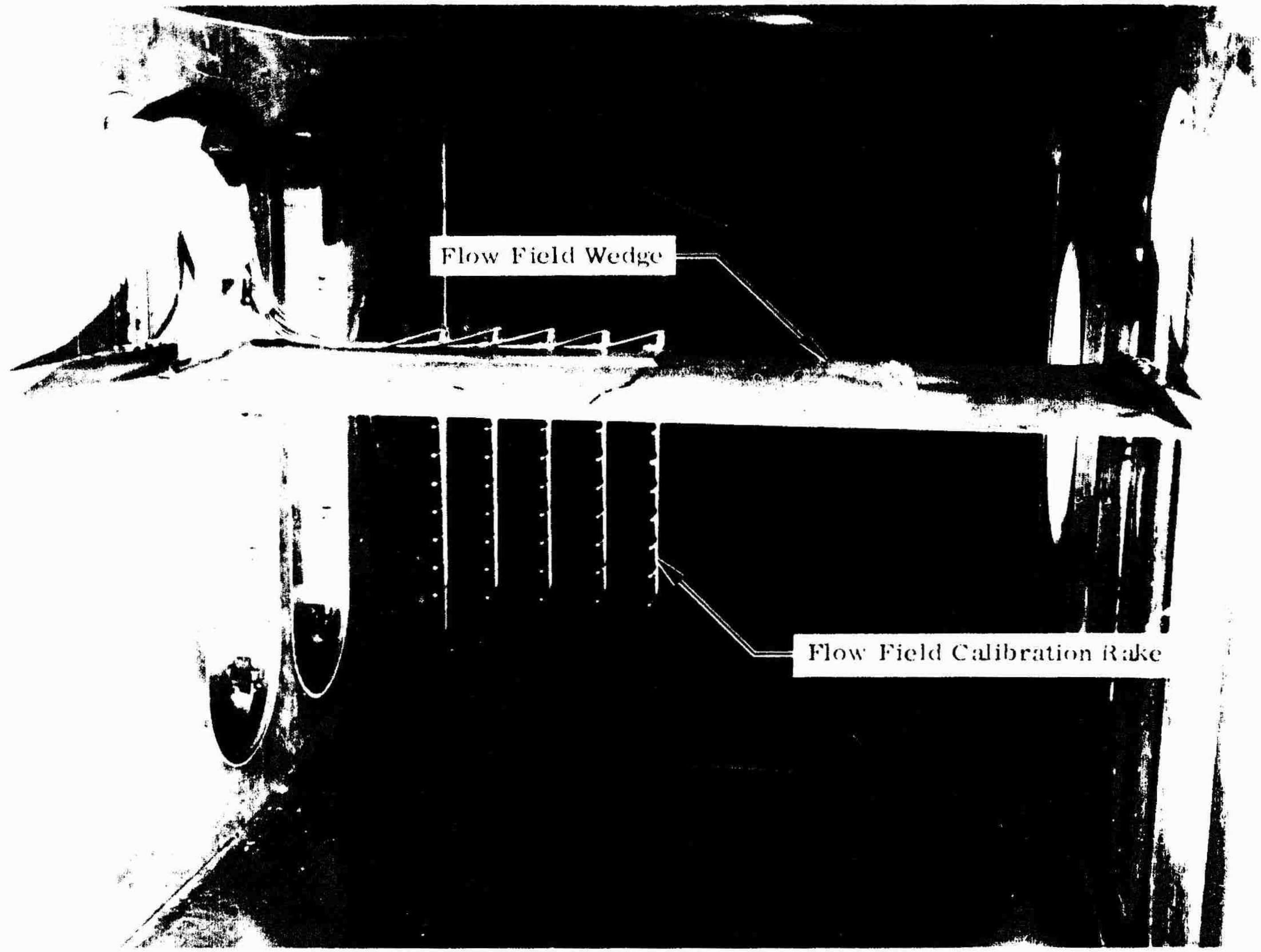


Figure 4. Metering Section Details

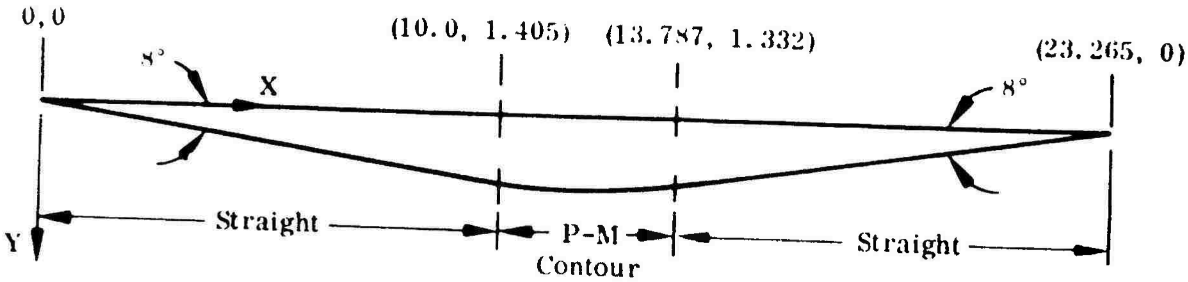


Figurc 5. Subsonic Diffuser Area Distribution at Design Mach Number



a. Wedge and Calibration Rake Installed in VKF-A Supersonic Wind Tunnel

Figure 6. Flow Field Generator Wedge



Wedge Surface	X, in.	Y, in.
8° Compression Surface	0.0 ↓ 10.0	0.0 ↓ 1.405
Prandtl-Meyer Contour (M_o = 2.0)	10.428 10.685 10.960 11.253 11.565 11.894 12.244 12.619 13.014 13.787	1.456 1.476 1.492 1.501 1.504 1.498 1.484 1.460 1.425 1.332
-8° Trailing Surface	13.787 ↓ 23.265	1.332 ↓ 0.0

b. Wedge Coordinates

Figure 6 Concluded

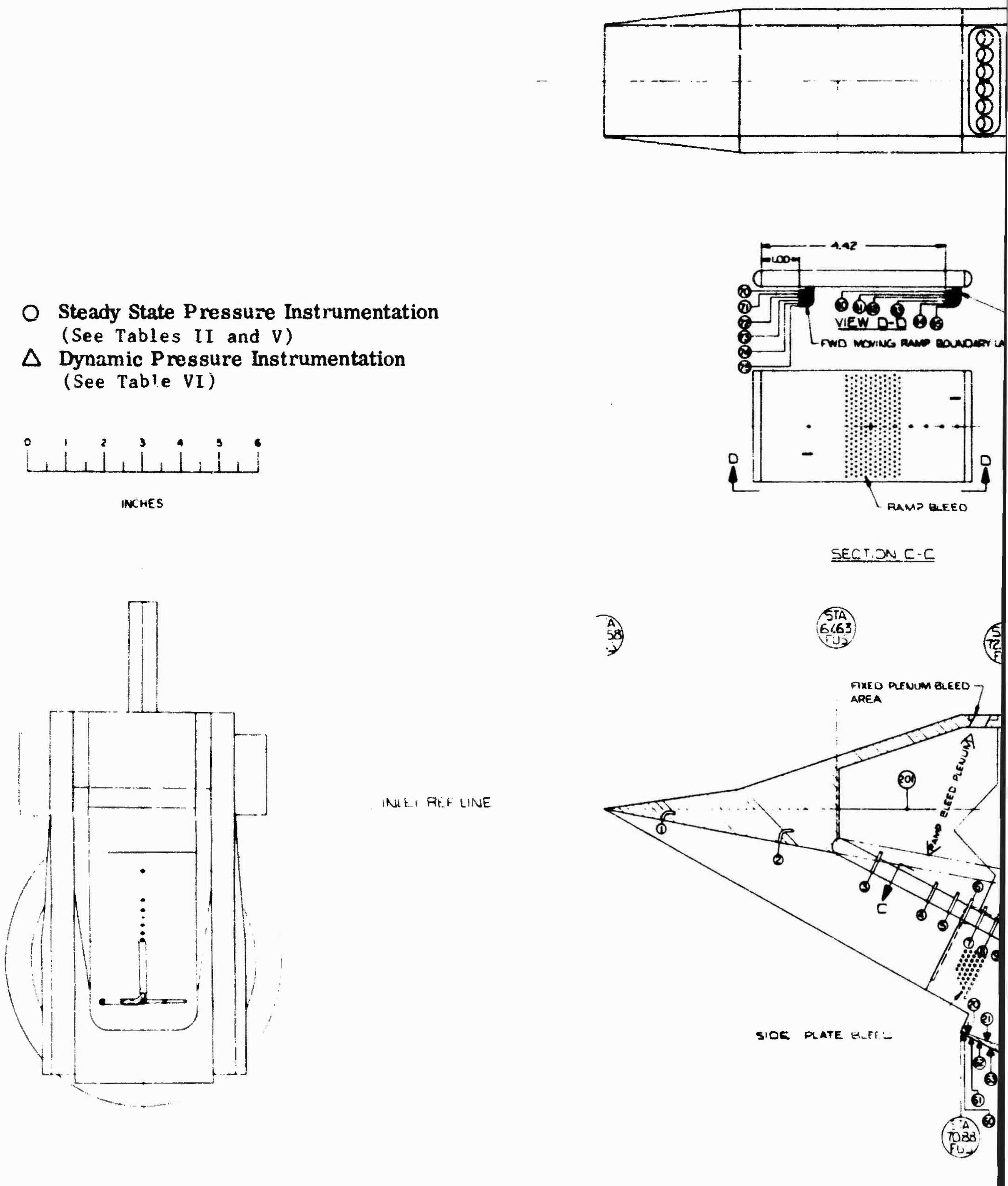
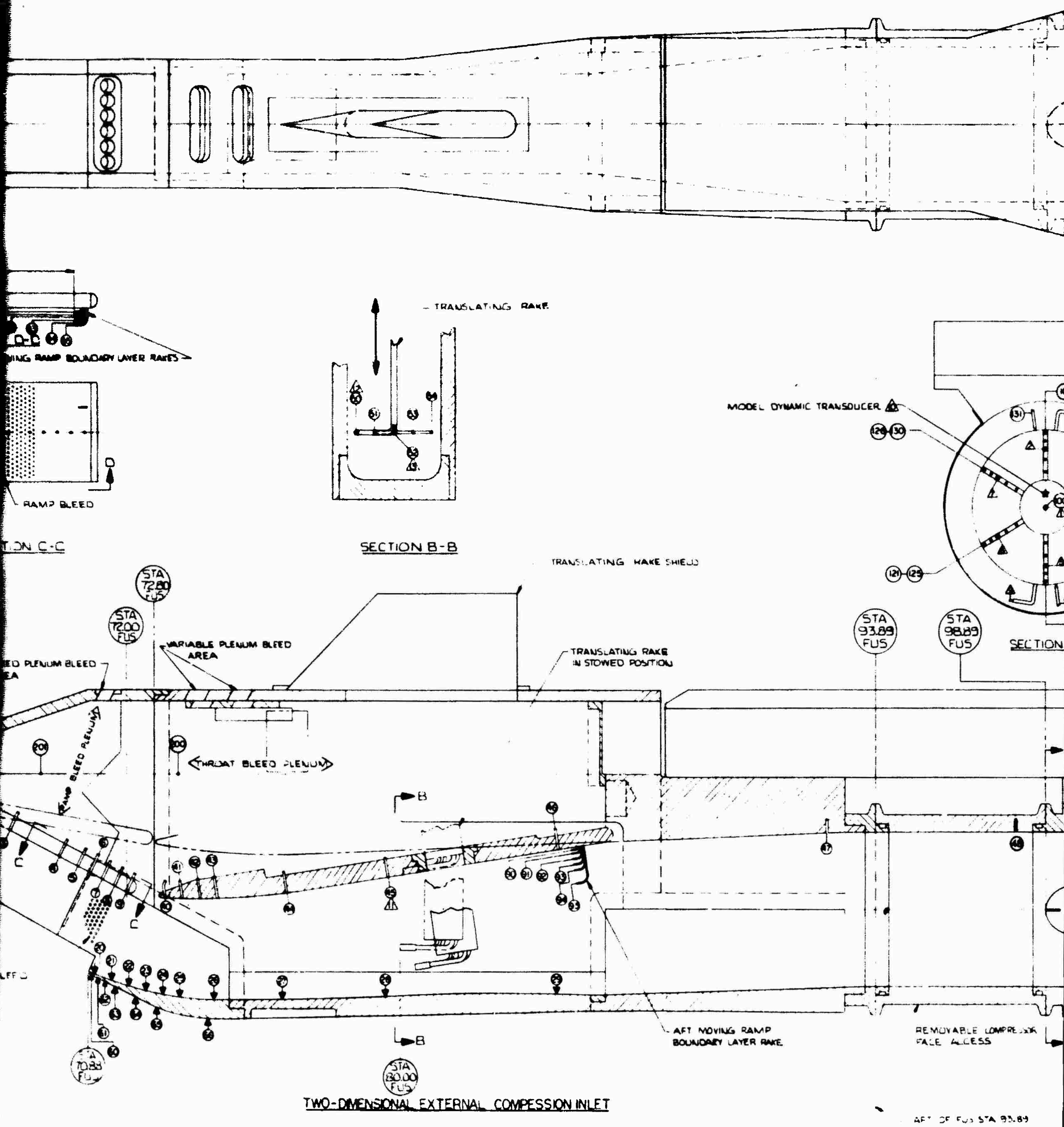
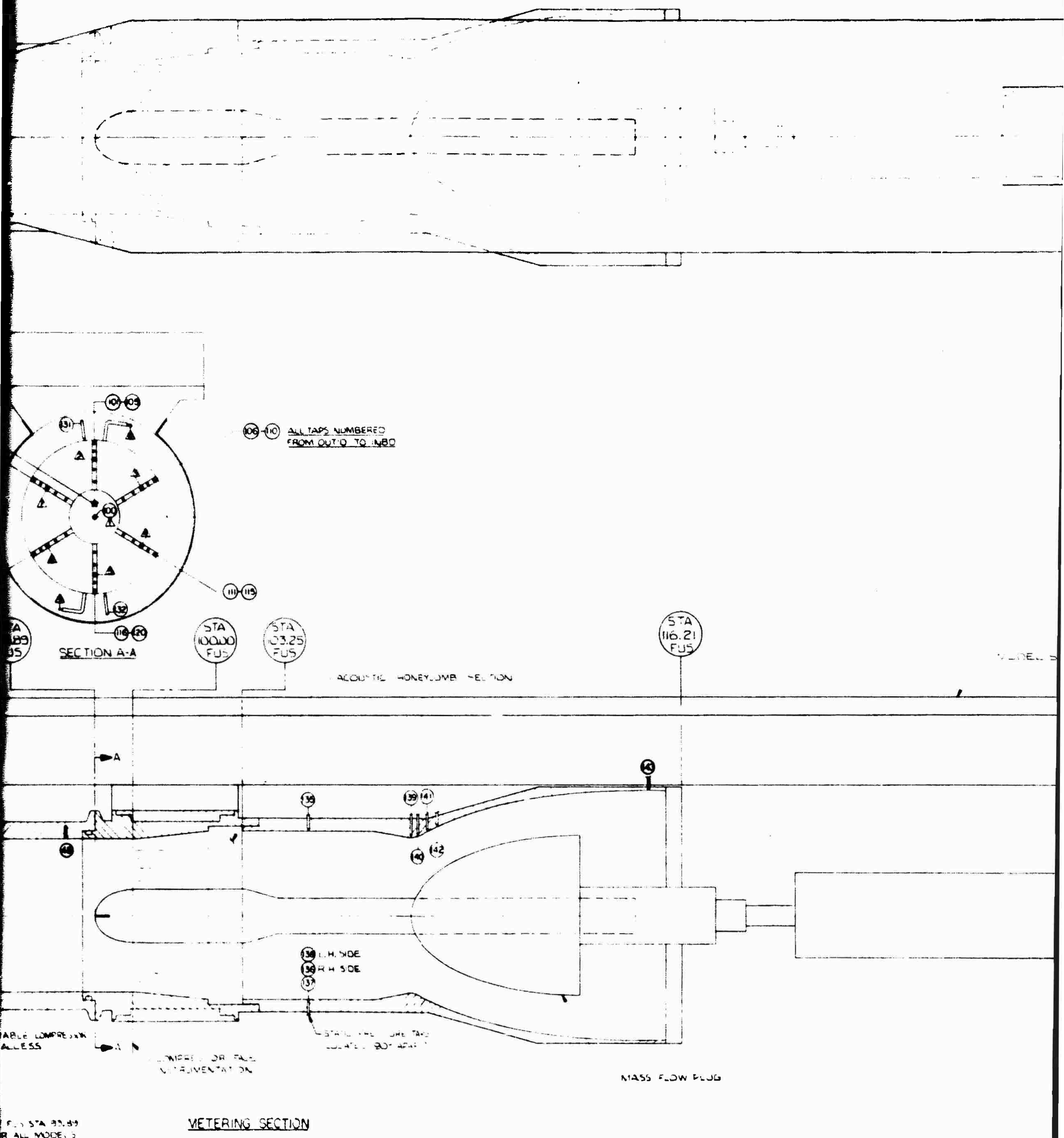


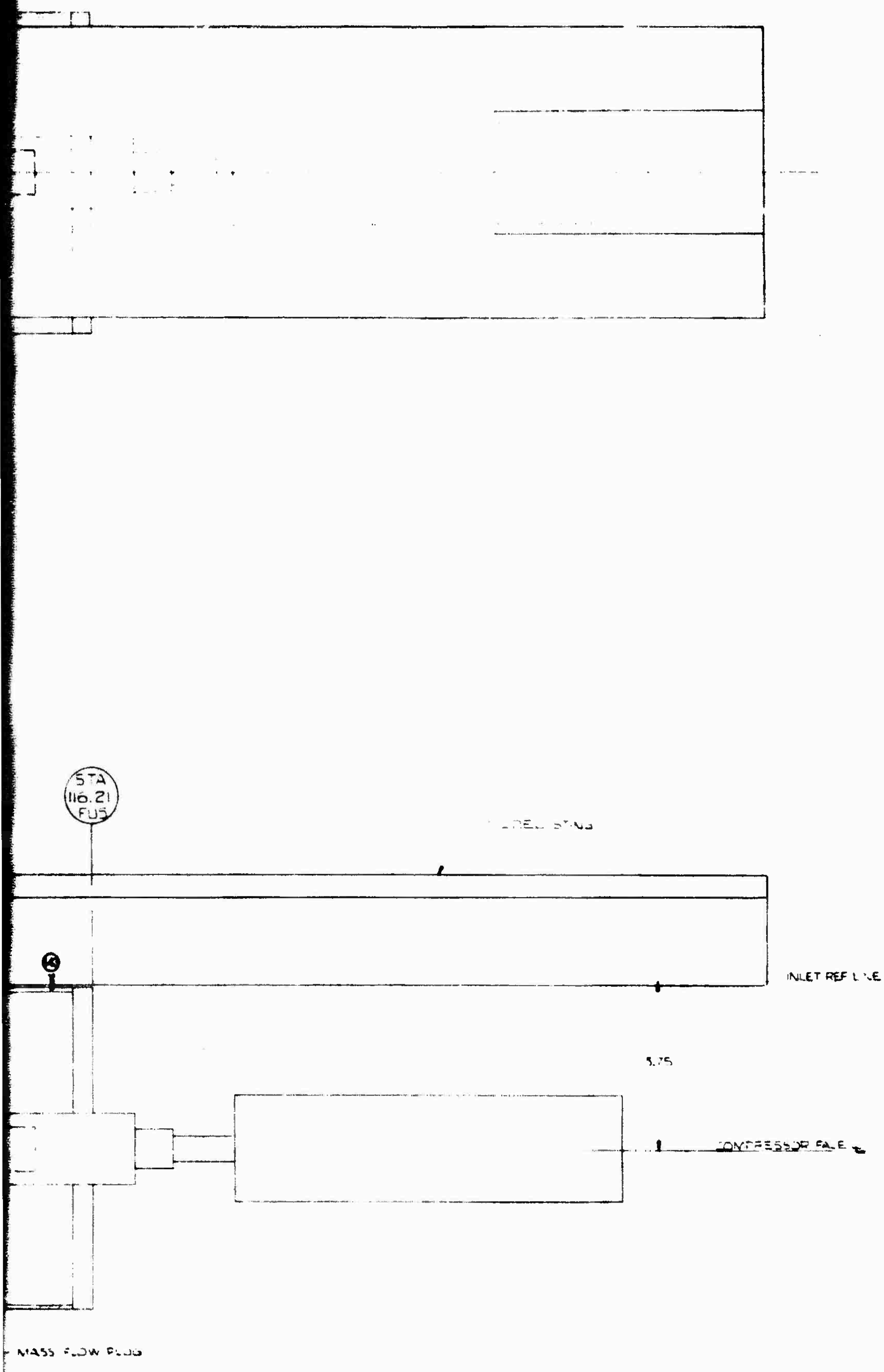
Figure 7. Two-Dimensional External Compression Inlet and Metering Section - Pressure Instrumentation Detail


TRANSLATING RAKE
MOVING RAMP BOUNDARY LAYER RAKES
D
RAMP BLEED
SECTION C-C
SECTION B-B
MODEL DYNAMIC TRANSDUCER
126-130
121-125
SECTION
TRANSLATING RAKE SHIELD
STA 72.80 FUS
STA 72.00 FUS
VARIABLE PLENUM BLEED AREA
FIXED PLENUM BLEED AREA
TRANSLATING RAKE IN STOWED POSITION
STA 93.89 FUS
STA 98.89 FUS
RAMP BLEED PLENUM
THROAT BLEED PLENUM
B
C
AFT MOVING RAMP BOUNDARY LAYER RAKE
REMOVABLE COMPRESSOR FACE ACCESS
STA 70.88 FUS
STA 80.00 FUS
TWO-DIMENSIONAL EXTERNAL COMPESSION INLET
AFT OF FUS STA 93.89 TYP FOR ALL MODELS

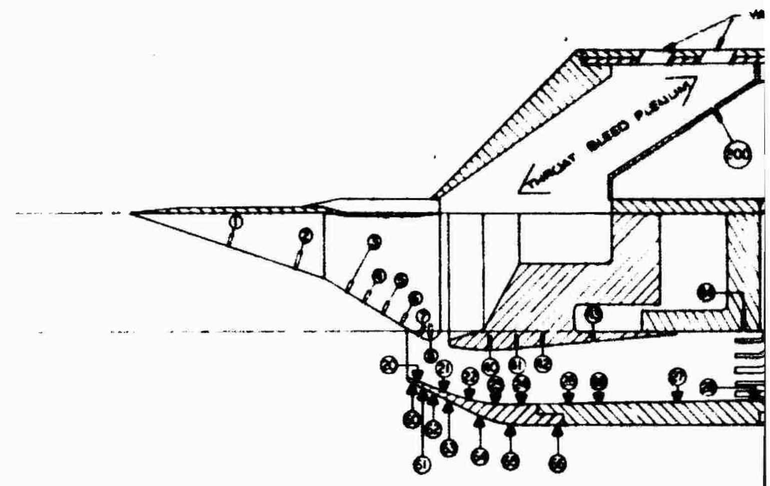
2

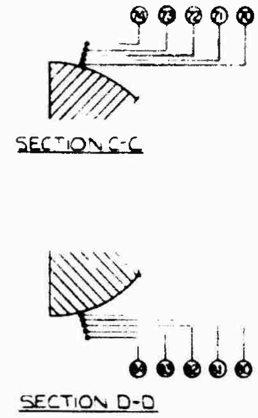

ALL TAPS NUMBERED
FROM OUT'D TO INBD
SECTION A-A
STA 100.00 FUS
STA 103.25 FUS
STA 116.21 FUS
L.H. SIDE
R.H. SIDE
MASS FLOW PLUG
METERING SECTION

3



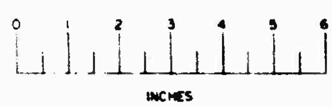
4

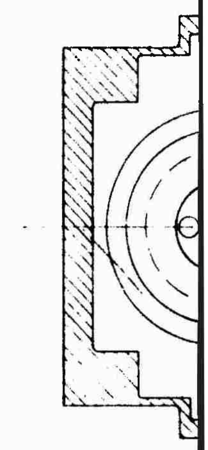




○ **Steady State Pressure Instrumentation**
(See Tables III and V)

△ **Dynamic Pressure Instrumentation**
(See Table VI)





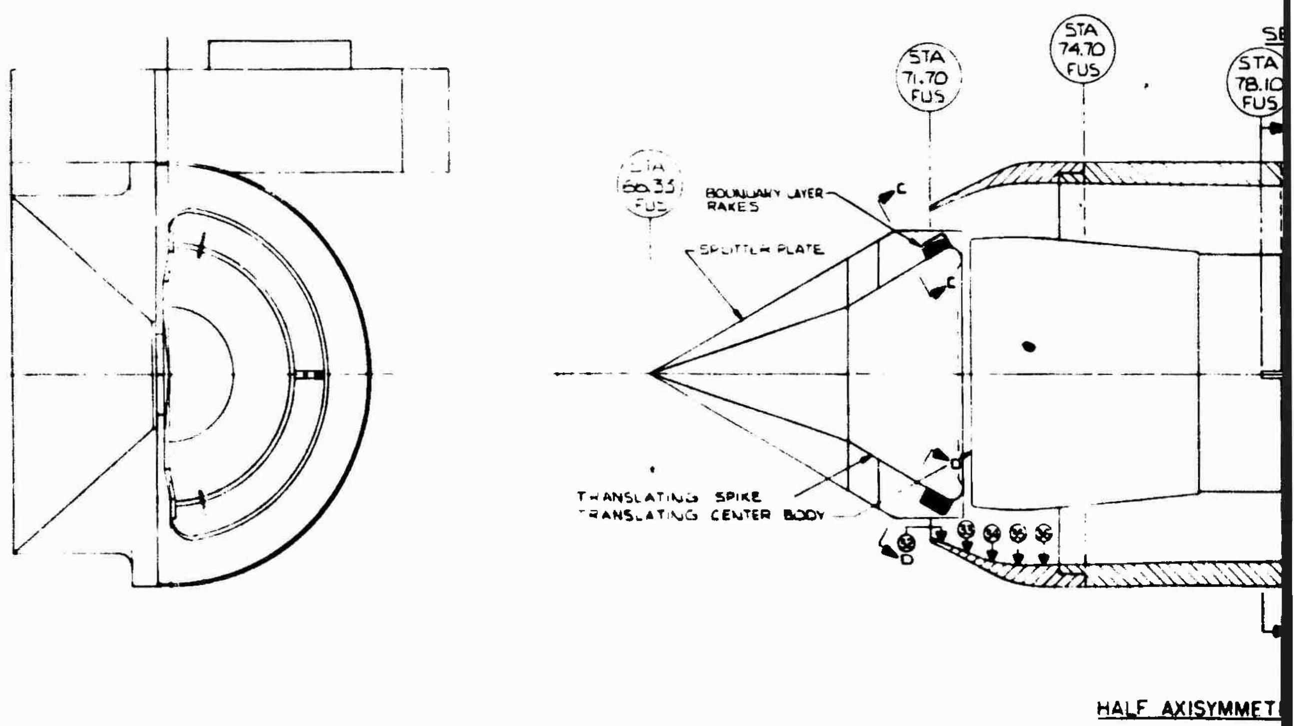


Figure 8. Half-Axisymmetric Inlet and Metering Section - Pressure Instrumentation Detail

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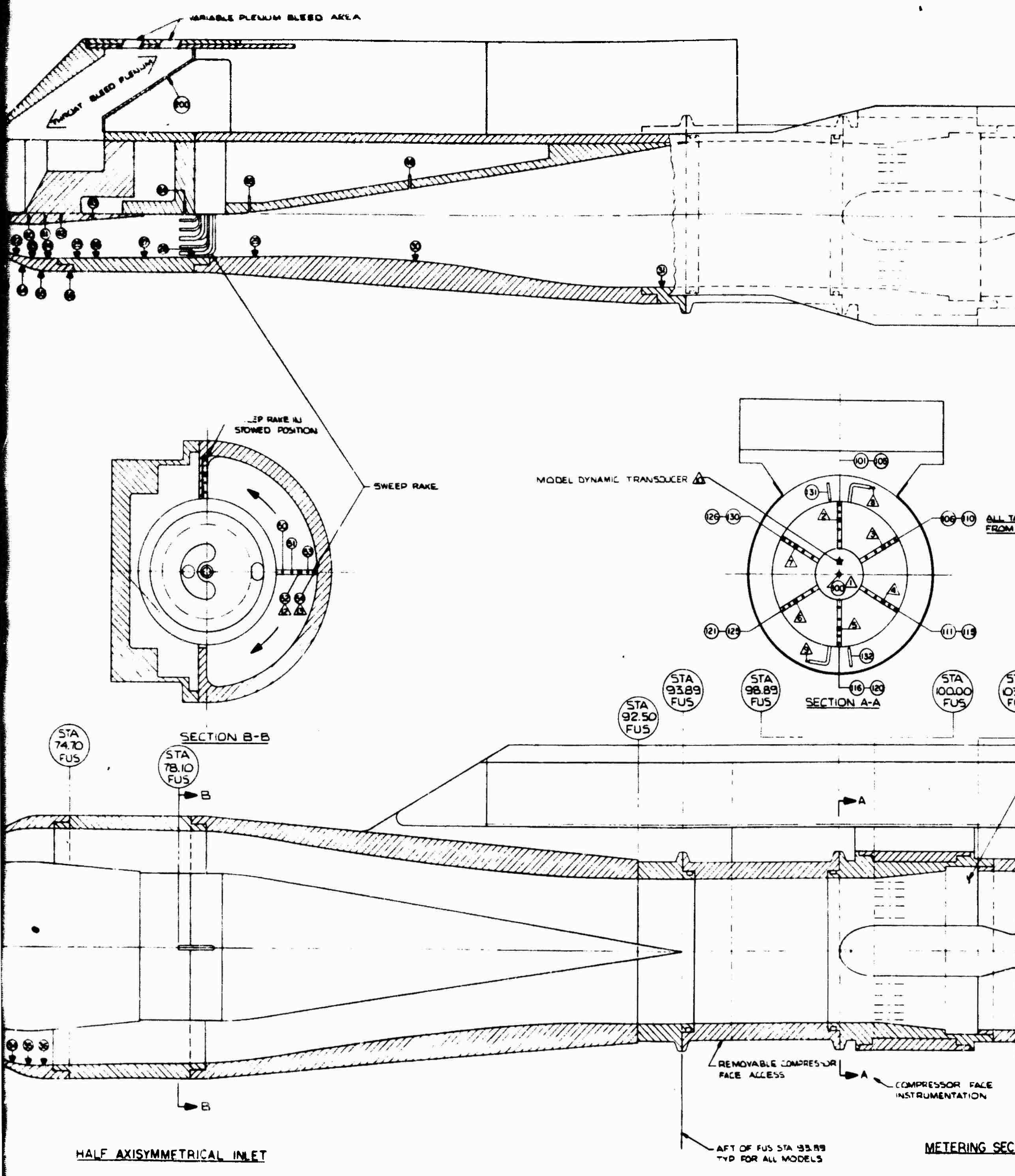

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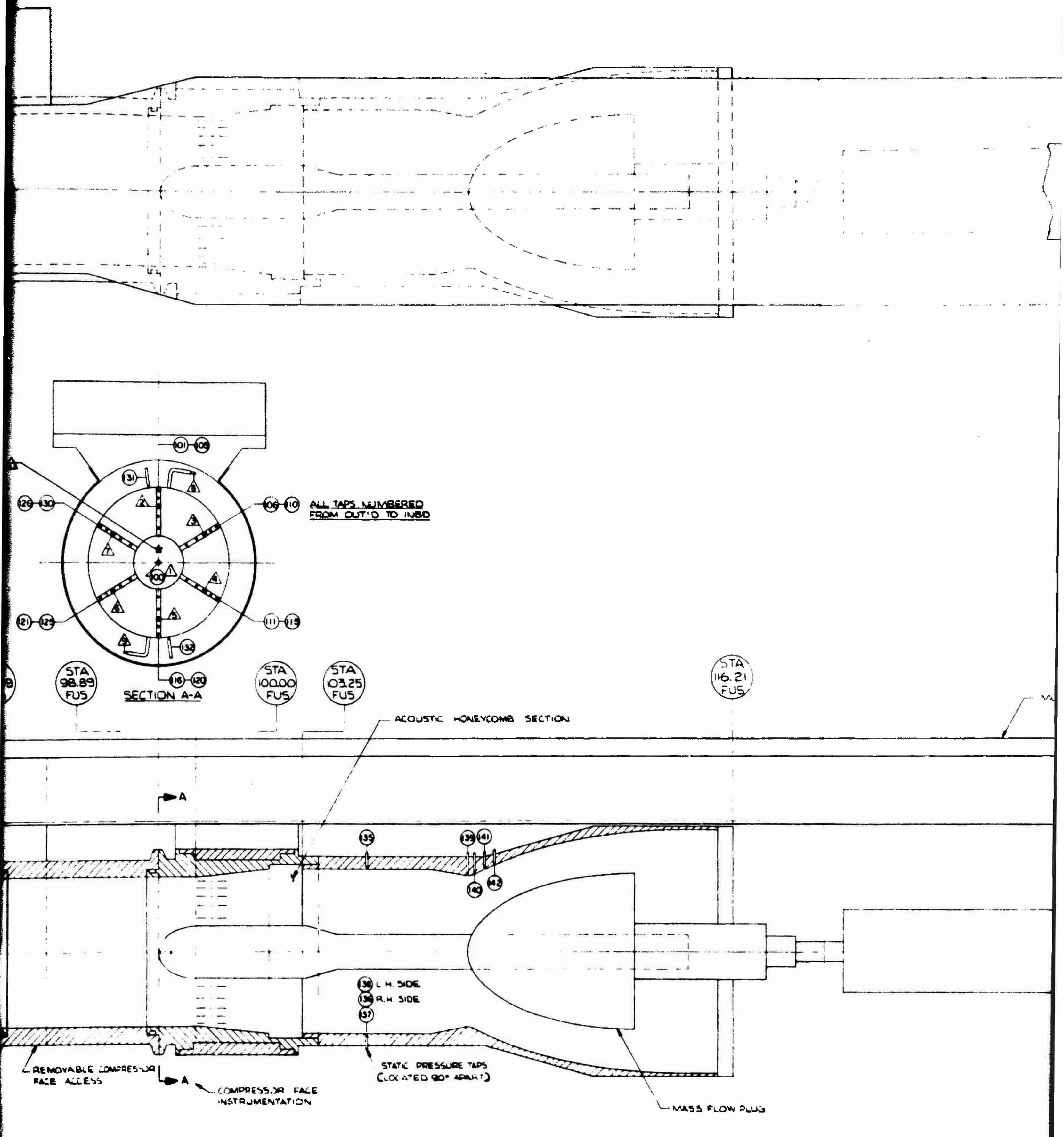

AFT OF FUS STA 93.89 TYP FOR ALL MODELS

METERING SECTION

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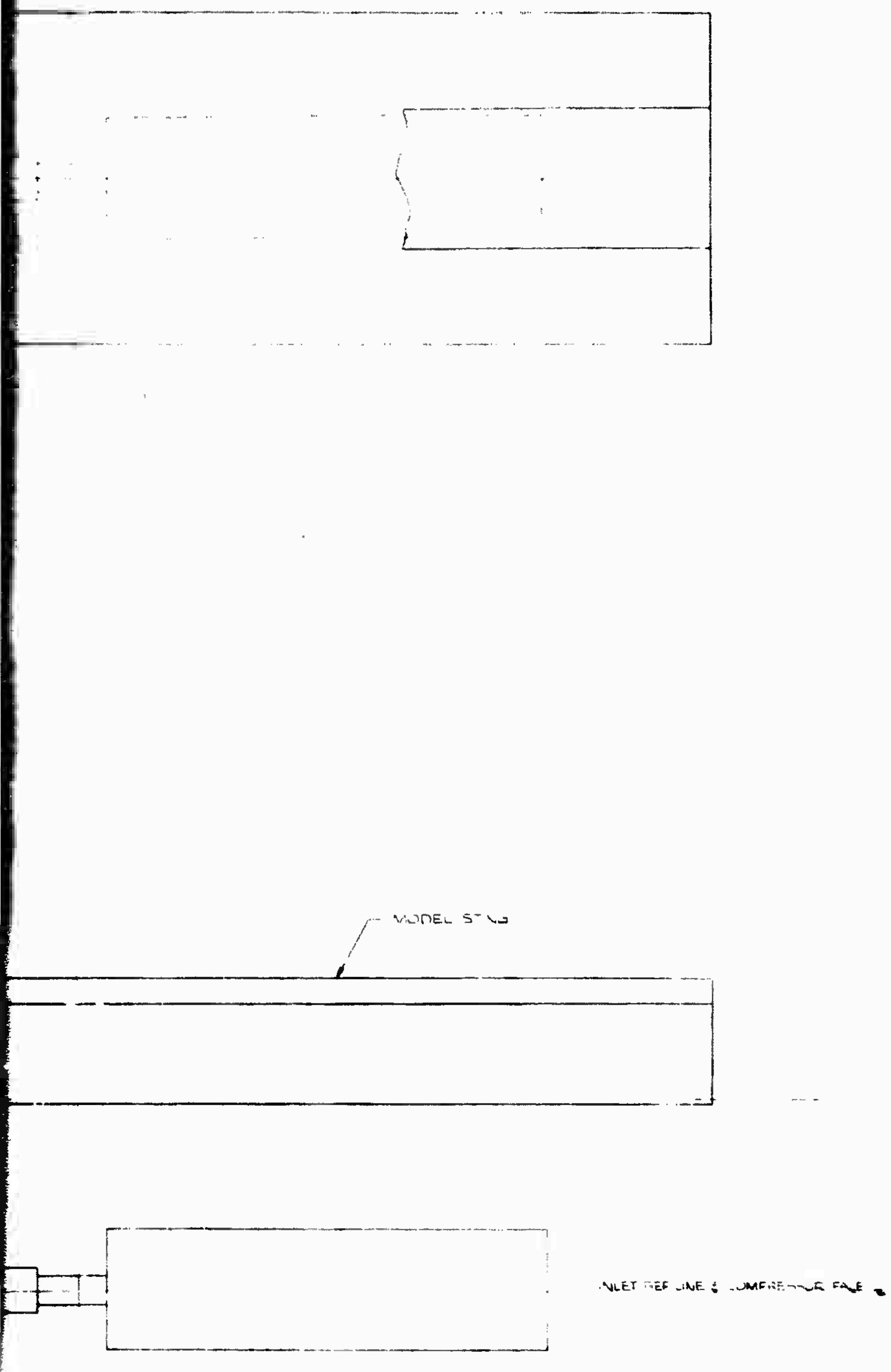

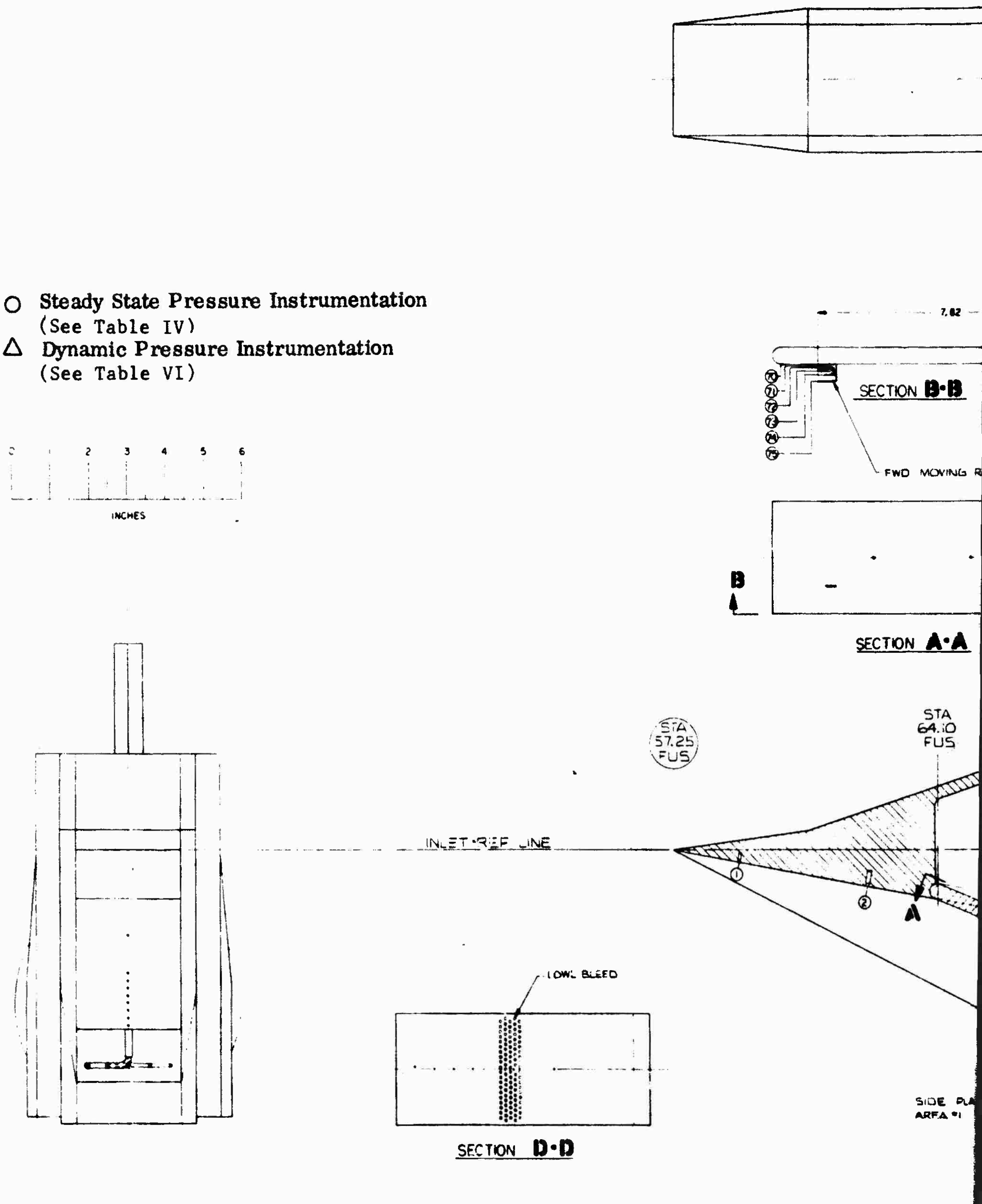

Figure 9. Two-Dimensional Mixed Compression Inlet - Pressure Instrumentation Detail

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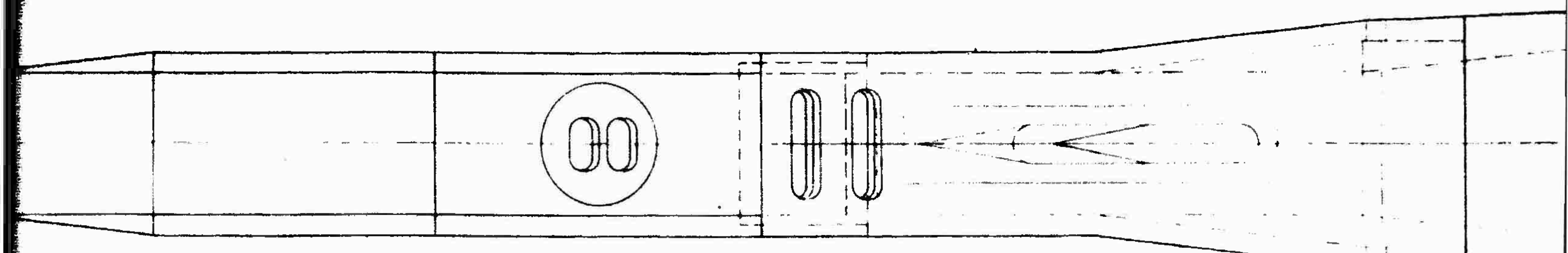

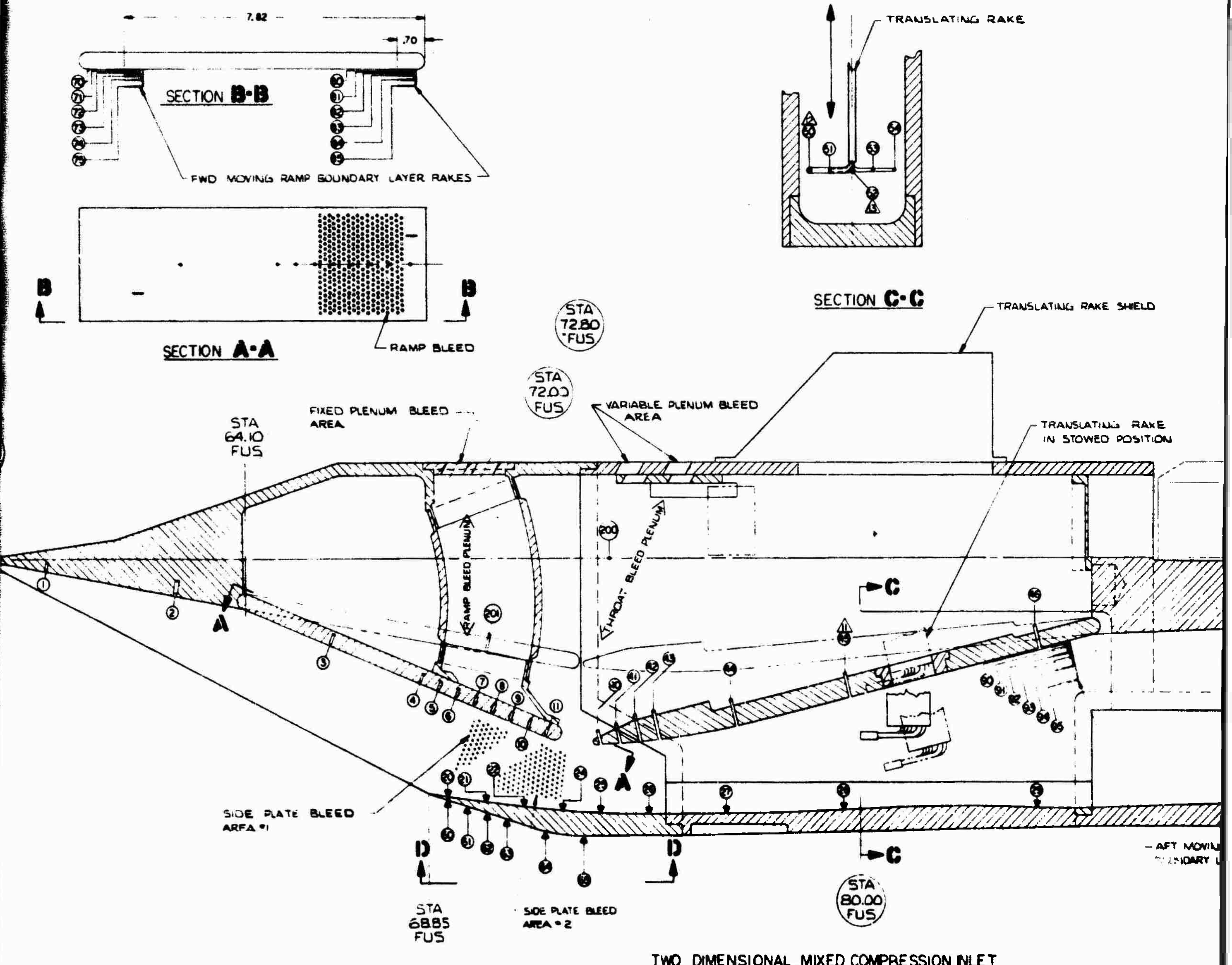

TWO DIMENSIONAL MIXED COMPRESSION INLET

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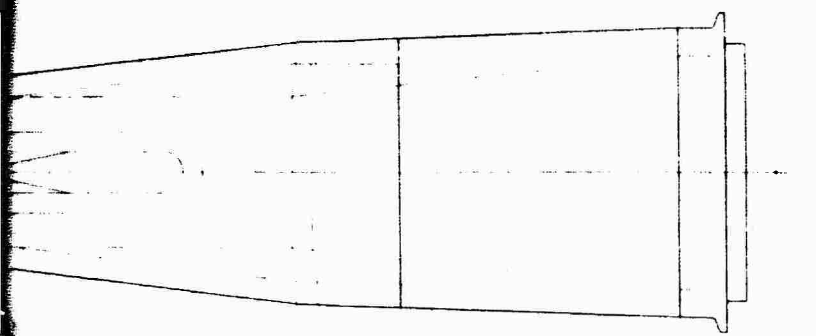
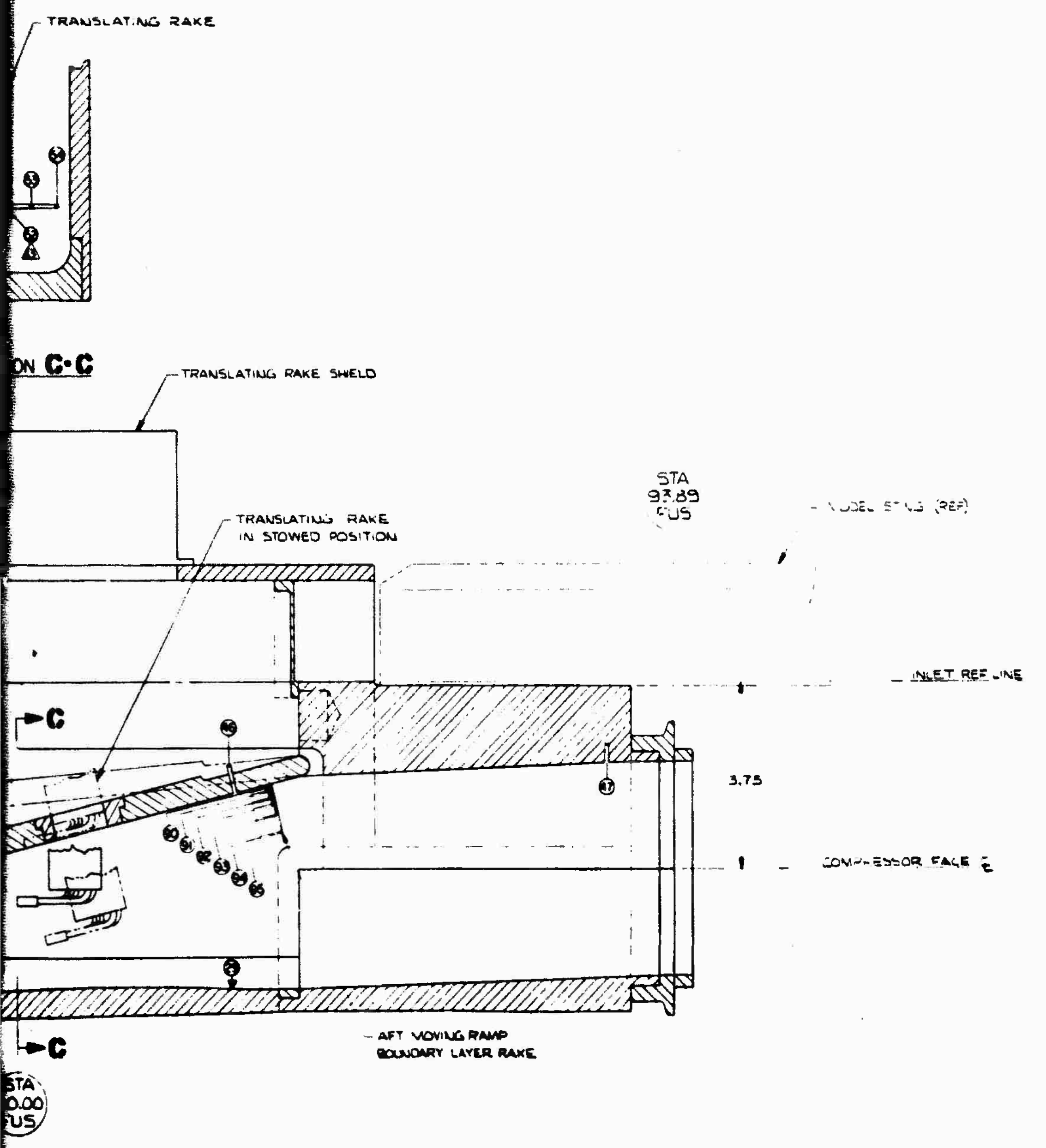




COMPRESSION INLET

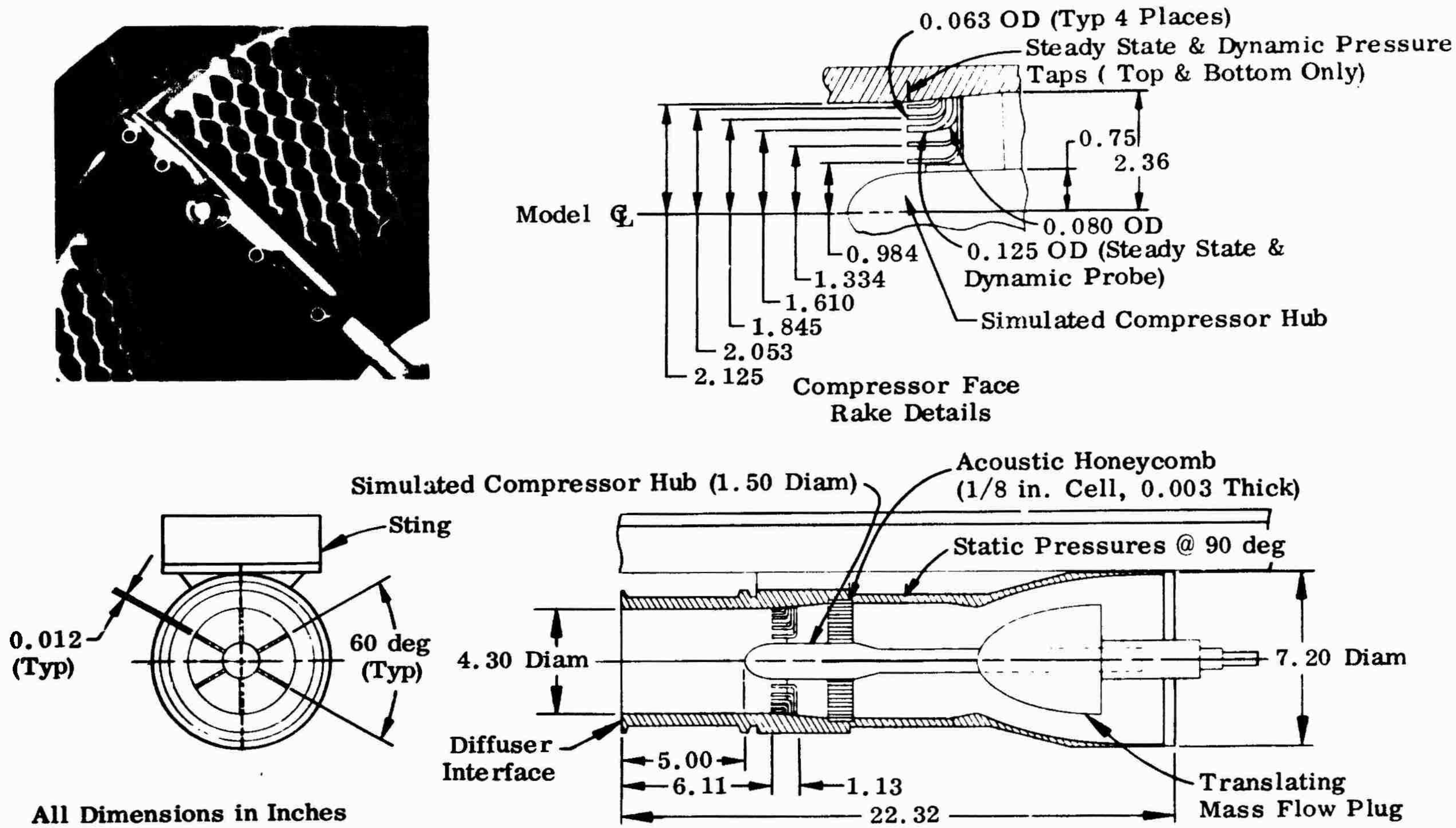
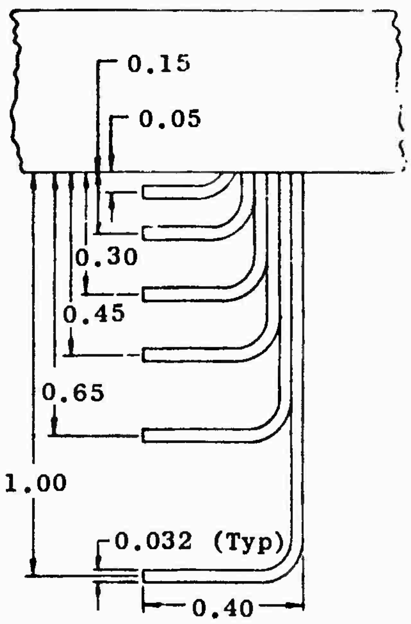
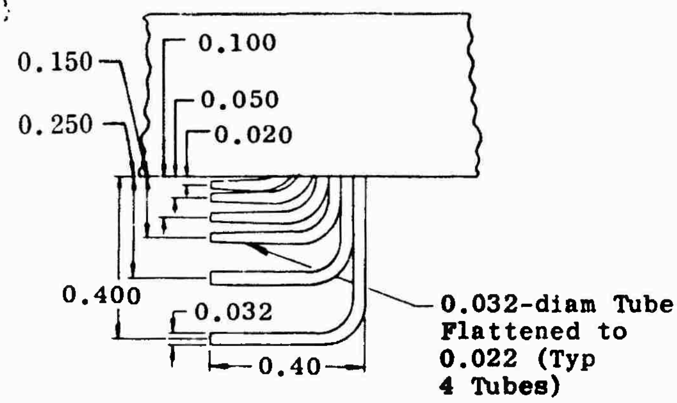


Figure 10. Metering Section Instrumentation Details

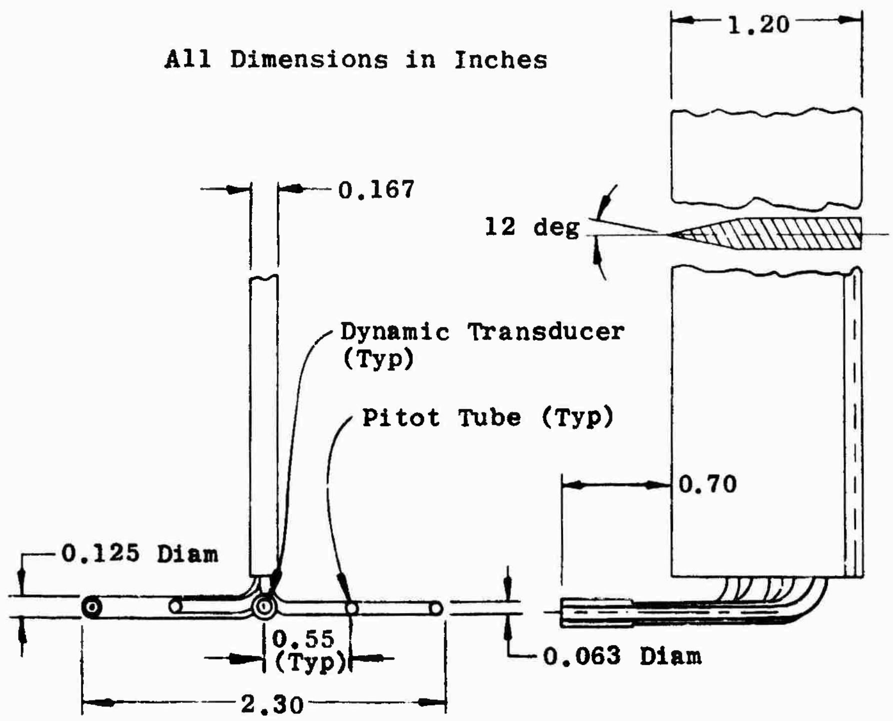


Diffuser Boundary Layer Rake



Ramp Boundary Layer Rake

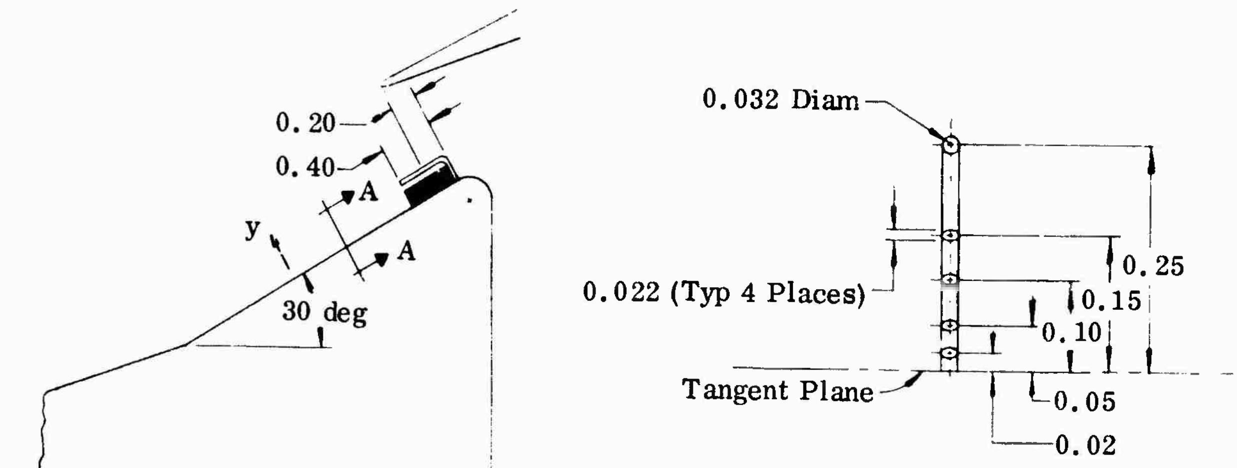
All Dimensions in Inches



Movable Rake

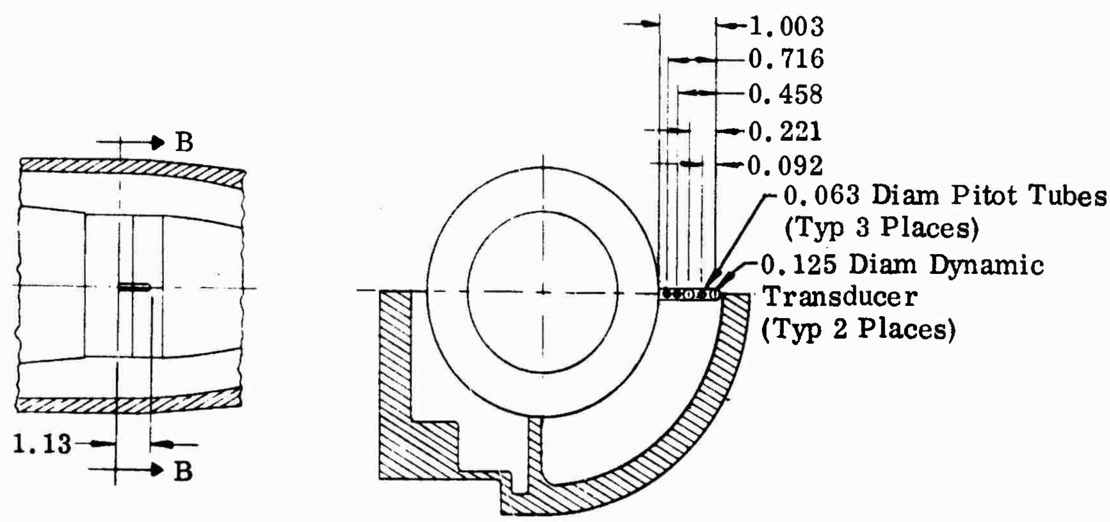
a. 2DE and 2DM Inlets

Figure 11. Movable Rake and Boundary Layer Rake Details



Section A-A

Centerbody Boundary Layer Rake



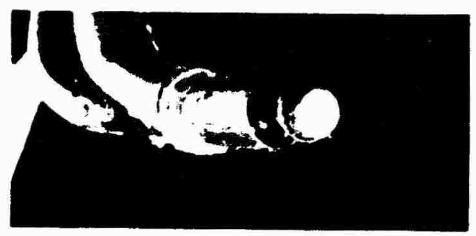
Section B-B

All Dimensions in Inches

Movable Rake

b. AX Inlet Rake Details

Figure 11 Concluded



Transducer with
Shield Removed

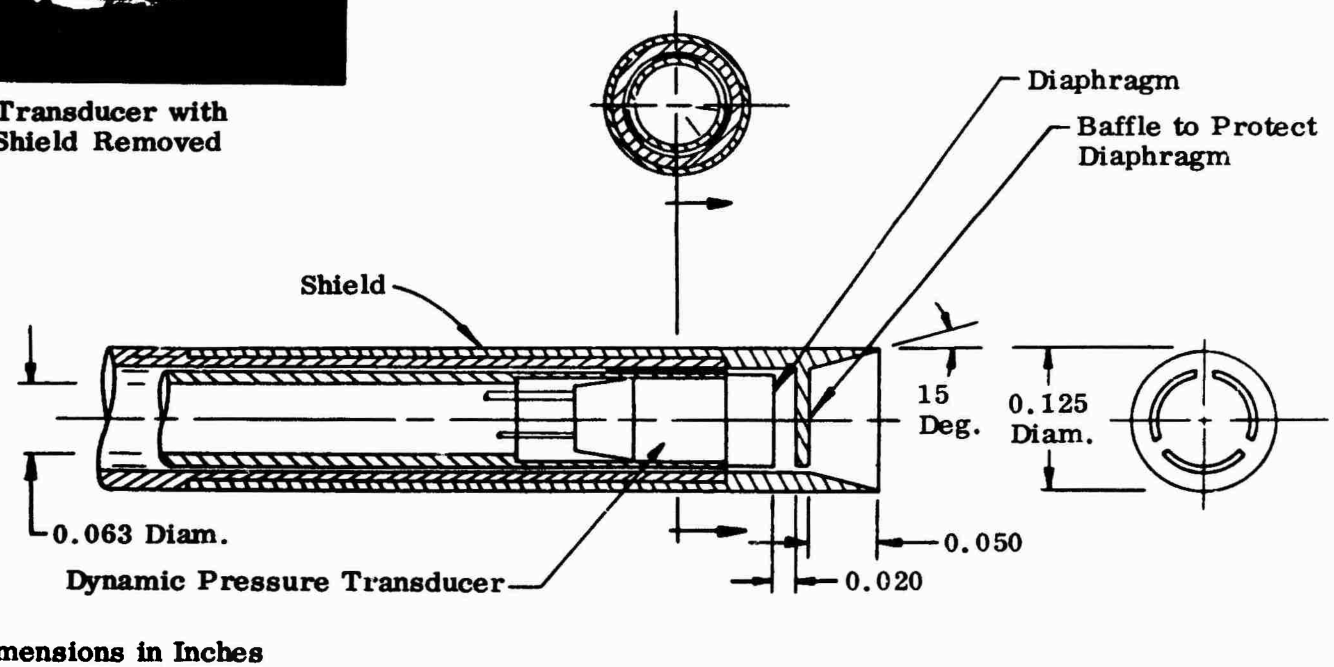
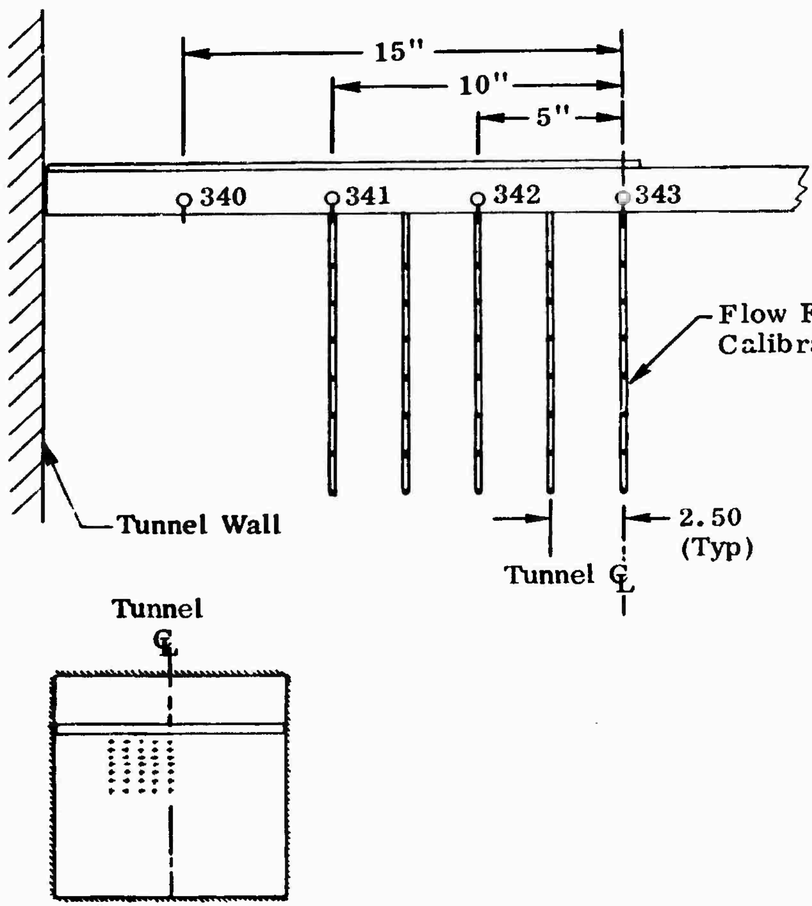
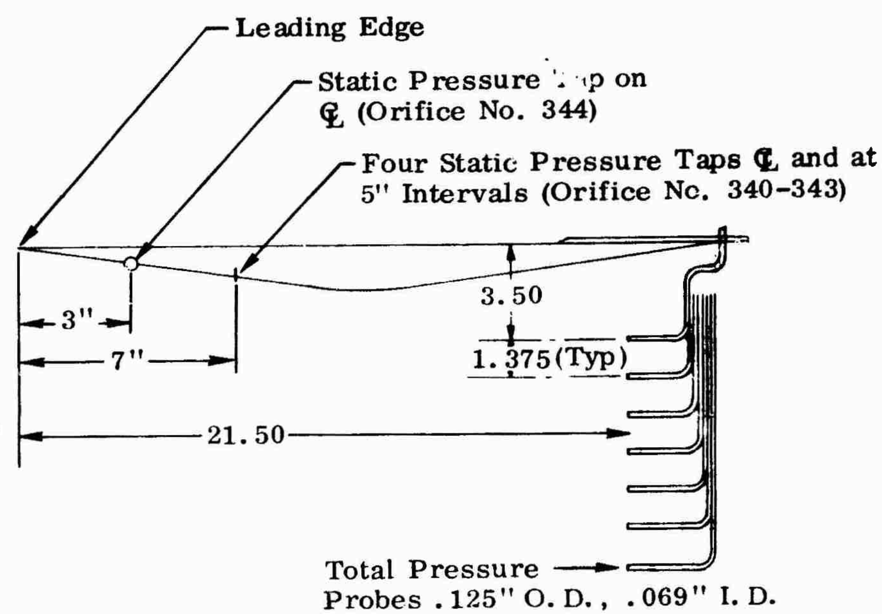


Figure 12. Typical Dynamic Total Pressure Probe Installation

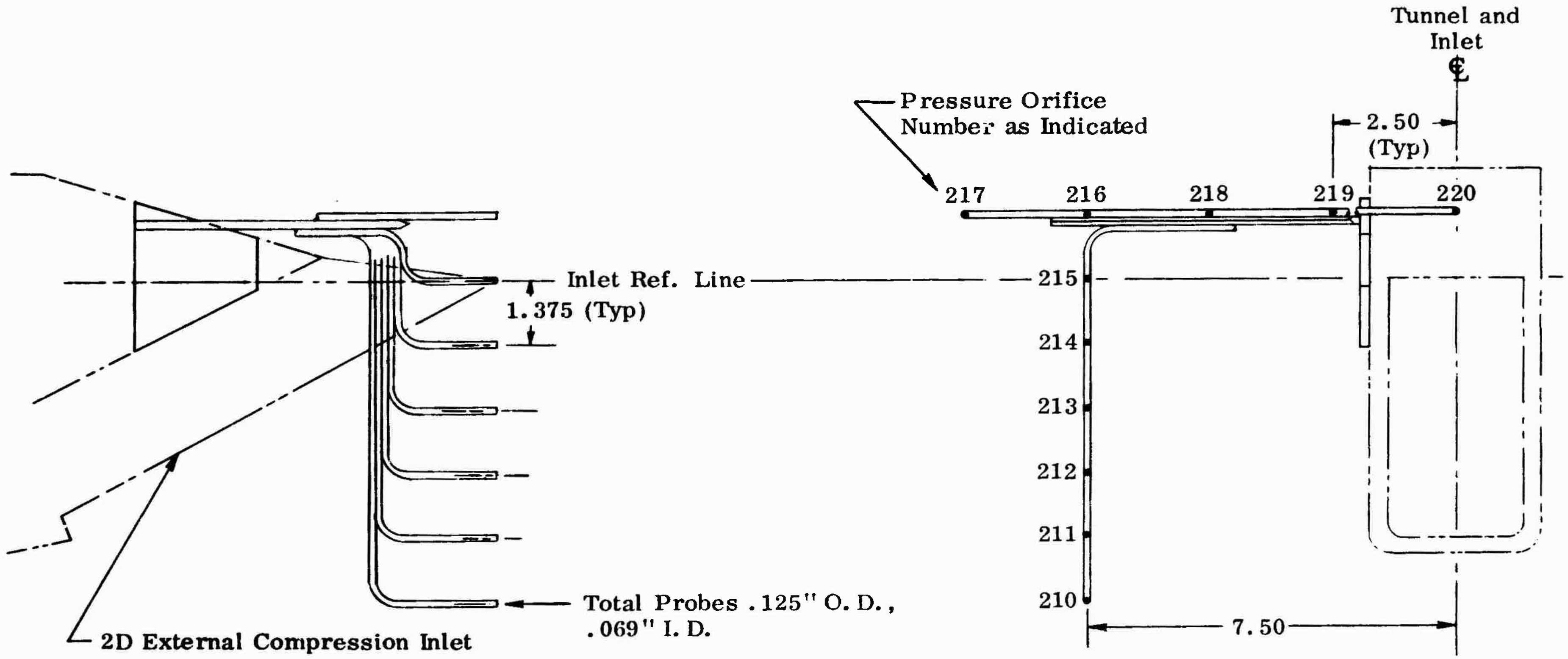




Flow Field Calibration Rake Orifice Number	
Rake (℄ to Left)	Orifice Number (Wedge Surface Down)
1	300-306
2	307-313
3	314-320
4	321-327
5	328-329

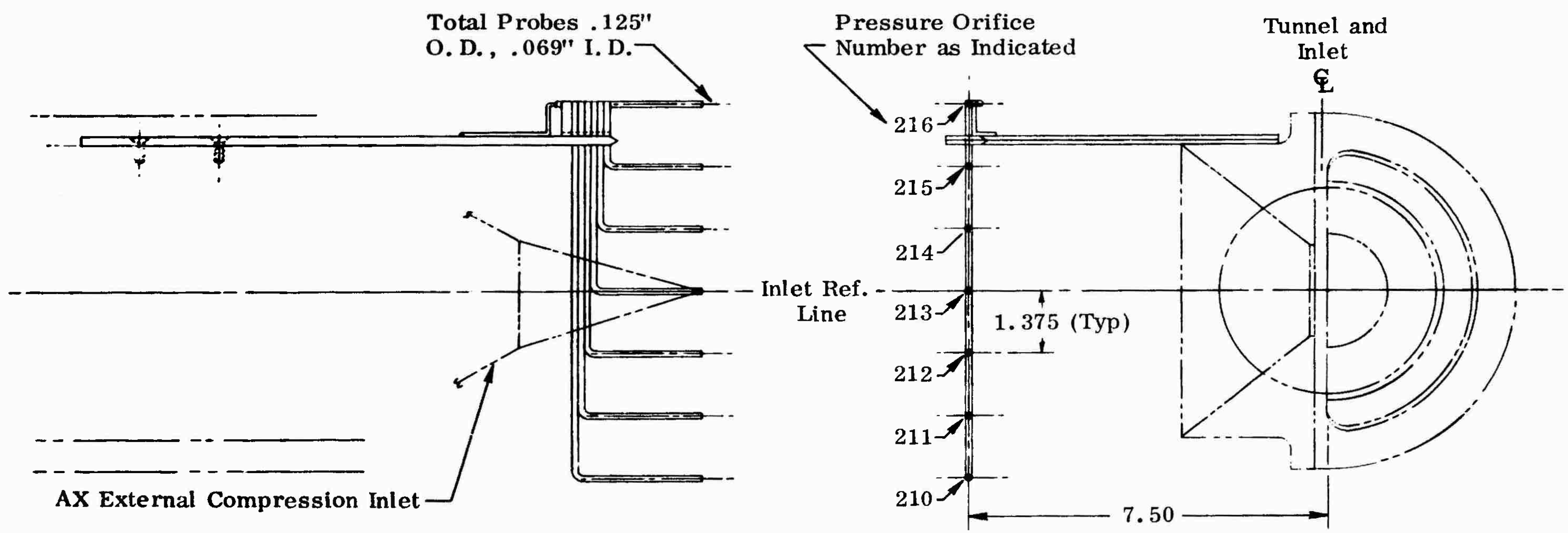
a. Flow Field Calibration Rake

Figure 13. Nonuniform Flow Field Pressure Instrumentation Details



b. 2DE Inlet Flow Field Rake

Figure 13 Continued



c. AX Inlet Flow Field Rake

Figure 13 Concluded

SECTION III

TEST INFORMATION

Test Conditions

The inlet models described in Section II were tested over a wide range of transonic and supersonic Mach numbers and angles of attack.

The tests were conducted in the VKF-A Supersonic Tunnel and the PWT-4T Transonic Tunnel at the Arnold Engineering Development Center, Arnold Air Force Station, Tennessee. The 2DE inlet model is shown mounted in the PWT-4T and VKF-A tunnel test sections in Figures 14 and 15, respectively. Tunnel operating conditions at which data were obtained in each of the tunnels are discussed below. For identification of specific model configurations associated with each tunnel operating condition, the reader is referred to the run log summary presented in Tables XIV, XV and XVI.

PWT-4T Transonic Wind Tunnel. Data were obtained at the test conditions indicated in Table VII.

TABLE VII. PWT-4T TEST CONDITIONS

M_o	$Re_o \times 10^{-6}$/ft	PTO, psia	T_o, °R
0.6	5.0	22.5	565
0.6	5.5	23.6	565
0.8	2.5	9.7	565
0.8	4.5	17.0	565
0.8	5.5	20.8	565
1.2	2.5	8.7	565
1.2	4.5	15.3	565
1.2	5.5	18.8	565

The tests were generally conducted at a Reynolds number of 5.5×10^6 per foot over the range of Mach numbers indicated. However, some tests were conducted at the lower Reynolds number due to tunnel power limitations during periods of simultaneous operation of more than one tunnel using the common power supply.

VKF-A Supersonic Wind Tunnel. Data were obtained at the tunnel operating conditions indicated in Table VIII.

TABLE VIII. VKF-A TUNNEL OPERATING CONDITIONS

M_o	$Re_o \times 10^{-6}$/ft	PTO, psia	T_o, °R
1.51	5.8	20.4	565
2.00	1.9	8.0	565
2.00	5.7	23.8	565
2.00	7.3	30.5	565
2.18	5.4	24.5	565
2.25	5.6	25.5	565
2.50	5.7	30.5	565
3.00	4.4	30.0	565

The tests were generally conducted at the highest Reynolds number per foot attainable, while maintaining approximately the same Reynolds number per foot at all Mach numbers. This resulted in Reynolds number of nominally 5.5×10^6 per foot over the range of Mach numbers from 1.5 through 2.50, except at Mach 2.0 where the effect of Reynolds number was a specific variable to be investigated. At Mach 3.0, testing was limited to a test Reynolds number of 4.4×10^6 per foot due to tunnel limitations.

Test Procedure

The test procedure established for testing the inlet models in the uniform tunnel flow field of the PWT-4T and VKF-A tunnels and for testing in the nonuniform flow field generated by the flow field wedge in the VKF-A tunnel follow.

Uniform Flow Field Tests. The test procedures followed in the VKF-A and PWT-4T tunnels were essentially the same except for the tunnel starting and shutdown procedures. The VKF-A tunnel was equipped with a model injection system which allowed the model to be injected into the tunnel for a test run or retracted from the tunnel for a model change without interrupting the tunnel flow. Thus, the starting and shutdown procedures at the VKF-A tunnel were accomplished with the model removed from the tunnel.

At the VKF-A tunnel, the model was injected into the tunnel after the desired Mach number and pressure conditions were established. Inlet parameters, such as compression ramp angle or centerbody position and throat bleed, were set at the

desired positions prior to model injection. During injection, the model was positioned at zero angle of attack and sideslip, with the inlet mass flow metering plug opened to a position where supercritical inlet operation was assured.

At the PWT-4T tunnel, the model was positioned in the tunnel at zero angle of attack and sideslip during tunnel starting, shutdown and Mach number changes. The flow metering plug was set at an open position during tunnel starts and shutdowns to reduce the aerodynamic loads on the model.

Once the model was positioned in the tunnel with the tunnel conditions established, the subsequent procedures were nearly identical for both tunnels. With the model positioned in the tunnel, the desired inlet parameters, compression ramp or centerbody position and throat bleed were set for the case of PWT-4T operation, and checked for the case of VKF-A operation. The model was then positioned at the desired angle of attack. Next, the inlet mass flow metering plug was positioned and data were then ready to be recorded.

The data recording was done in two modes. First, all the data except the movable rake data were recorded, and secondly, the movable rake was stepped sequentially to five positions, with the rake data recorded at each position. This procedure was repeated for approximately five flow metering plus settings for each test condition. Steady state and dynamic data were recorded simultaneously at each data point.

For supersonic test conditions, the range of mass flow ratios investigated extended from supercritical to incipient buzz. Within this range, compressor face data were obtained at supercritical, near critical, predicted operational, subcritical, and incipient buzz conditions for each supersonic test condition. At subsonic test conditions, compressor face data were obtained at similar values of mass flow conditions, except that the lowest mass flow was selected to cover the probable range of operation of the engine. Because of the time associated with sweeping the movable rake to survey the diffuser, data at this station were generally limited to three mass flow points: supercritical, operational and subcritical. It is noted that the movable rake was stowed in the duct wall during measurements of compressor face data.

Nonuniform Flow Field Tests. For the inlet tests in the nonuniform flow field, the inlet was placed in the expansion fan of the flow field generator wedge such that the desired Mach number variation, ΔM, was realized across the inlet reference plane ab (Figure 16). The inlet reference plane ab was defined as the projection of the inlet

capture area normal to the model axis on a plane passing through the forward tip of the inlet compression surface. The magnitude of the Mach number variation, ΔM, was controlled by the relative position of the wedge with respect to the inlet models. Thus, in moving the inlet model toward the wedge, the value of ΔM was increased, and conversely, moving the model away from the wedge, the value of ΔM was decreased. Figures 17 and 18 show the 2DE and AX inlet models mounted in the VKF-A tunnel downstream of the flow field generator wedge.

In addition to the procedures outlined for testing in the uniform flow, testing in the wedge flow field required positioning of the wedge and inlet model for each test condition. Tables X through XIII show the position of each of the inlets with respect to the wedge as a function of Mach number, angle of attack, and the flow field gradient, $\Delta M/M_0$. Changes in wedge position and model position were both accomplished with the tunnel operating. The wedge position (YM) was adjusted by cranking lead screws on each end of the wedge. The wedge alignment was maintained by sighting through a transit. The inlet model position (XM) was adjusted through the use of the model injection system mechanism.

Data Precision

The precision of the basic tunnel parameters (total pressure, total temperature and test section Mach number) for each of the PWT-4T and VKF-A tunnels are presented in References 1 and 2, respectively. A discussion of the precision of the model, instrumentation, and resulting data follows.

Steady State Pressure Measurements. All of the steady state pressure measurements in the PWT-4T were made with individual (15 psid) transducers. The estimated uncertainties in the pressure recovery resulting from the tunnel pressure transducer system were estimated to be no greater than ±0.15 percent. The uncertainty of the model angle of attack was no greater than ±0.1 degree.

At the VKF-A tunnel, pitot pressure measurements for the movable rakes were obtained with individual 15 psid transducers with variable reference and having full scale calibrated ranges of 5 to 15 psid. All other steady state pressures were measured with 25 psid strain gage transducers mounted in three 48 port Scanivalves. The uncertainty of the movable rake pressure measurements was estimated to be ±0.3 percent. The other steady state pressure measurements were estimated to have an uncertainty of ±1.0 percent. The precision of the model angle of attack was estimated to be ±0.1 degree.

Based on the laboratory calibrations, and on the precision of the potentiometers used, the estimated uncertainty in the position of the translating model components (centerbodies, mass flow plug, throat bleed orifice plate and 2D model movable rake) was ±0.10 inches. The precision of the rotating components, 2DE and 2DM compression ramp angles and AX model movable rake was estimated to be ±0.1 degree and ±1.0 degree, respectively. Calibration of the flow field wedge indicated that the effective angle of the wedge at all Mach numbers was 0.5 to 1.0 degrees greater than the nominal 8 degree angle (Figure 6).

Calibrations of the mass flow system conducted at the Northrop Aerosciences Laboratory indicated uncertainties of ±2 percent in the inlet mass flow metering throat bleed and ramp bleed systems.

Dynamic Pressure Measurements. The dynamic pressure probes were calibrated at each of the wind tunnels to determine the transducer response to known levels of excitation. Based on these calibrations the uncertainty of the dynamic pressure measurements was estimated to be ±1.4 percent. In addition to the uncertainties noted above, the presence of oil in tunnel air resulted in the contamination of the compressor face dynamic probes during tests in the PWT-4T tunnel. Since the accumulation of oil on the probes would be a function of exposure time, a chronological inspection of the data was conducted. Based on this study (see Volume I for details), it was concluded that the dynamic data measured at the compressor face was questionable after part number 300. The dynamic data from the probes on the movable rake and the wall mounted statics were unaffected by the oil contamination.

Inlet Parameters. Assuming a combination of maximum freestream and pressure measurement uncertainties, the precision of the derived inlet parameters was computed to be as shown in Table IX.

TABLE IX. INLET PARAMETER UNCERTAINTIES

Inlet Parameter	Uncertainties, Percent	
	VKF-A	PWT-4T
PTCF/PTO	1.1	.4
PTR/PTO	.6	.4
RMSCF/PTCF	1.7	1.3
RMSR/PTR	1.4	1.3
WCF/WC	2.5	2.2
WBR/WC	2.5	2.2
WBT/WC	2.5	2.2

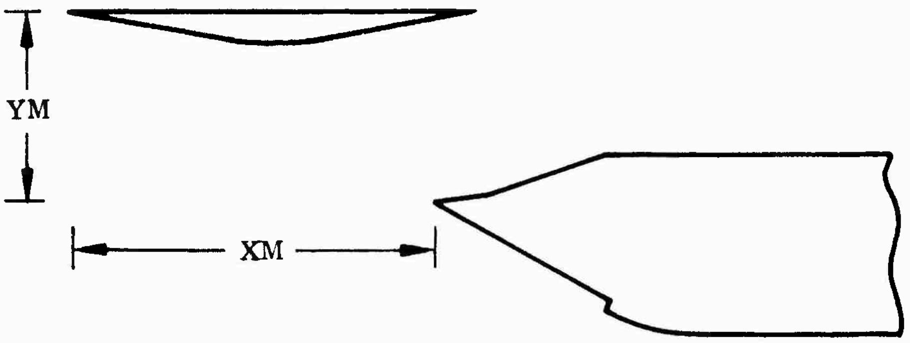
Estimated uncertainties in the distortion indices for each of the tunnels based on the precision of individual pressure measurements were:

DICF = ±0.014 and DIR = ±0.003 at the VKF-A tunnel and DICF and DIR = ±0.003 at the PWT-4T tunnel.

Summarized Run Log

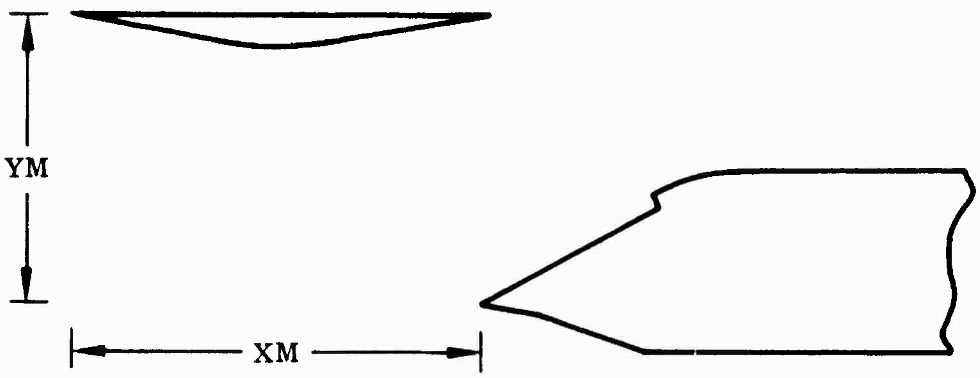
A complete summary of the tests conducted during the course of this study are presented in Tables XIV through XVI. The transonic tests conducted at the PWT-4T tunnel are summarized in Table XIV. Supersonic tests concluded at the VKF-A tunnel are summarized for uniform and nonuniform flow field tests in Tables XV and XVI, respectively. The test points (part number at PWT-4T and group number at VKF-A) are grouped together for each primary variable tested. The primary variable in each series is indicated by an arrow.

TABLE X. WEDGE — INLET POSITION, 2DE INLET UPRIGHT



M_o	$\Delta M/M_o$	α, deg.	XM, in.	YM, in.
1.75	.15	0	23.7	7.6
	.20	0	19.3	8.6
	.20	5	20.1	5.0
	.20	15	21.8	5.8
2.0	.15	0	25.7	7.2
	.15	5	26.6	7.6
	.15	10	27.7	8.1
	.20	0	21.0	4.7
	.20	5	21.9	4.9
	.20	10	22.7	5.3
	.20	15	23.3	5.5
2.25	.15	0	27.6	6.9
	.20	0	22.3	4.4
	.20	5	23.2	4.7
	.20	10	24.0	4.9
	.20	15	24.5	5.1
2.5	.10	0	39.7	10.7
	.15	0	29.5	6.5
	.20	0	23.9	4.4
	.20	5	24.9	4.5
	.20	10	25.4	4.7
	.20	15	25.9	4.8

TABLE XI. WEDGE – INLET POSITION, 2DE INLET INVERTED

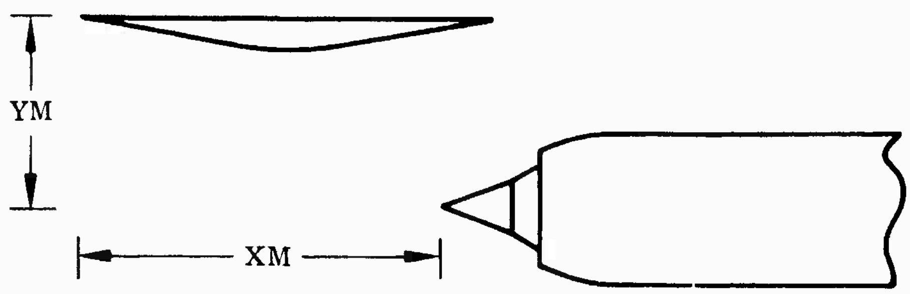


M_o	$\Delta M/M_o$	α, deg.	XM, in.	YM, in.
1.75	.15	0	23.7	13.1
1.75	.20	0	19.3	10.1
2.0	.15	-4	26.2	13.2
↓	.15	0	25.7	12.7
	.15	5	24.9	12.2
	.15	10	24.0	11.5
	.15	15	22.9	10.7
	.20	0	21.0	10.2
2.25	.15	0	27.6	12.4
2.25	.20	0	22.3	7.9
2.50	.10	0	39.7	16.2
↓	.15	0	29.5	12.0
	.20	0	23.9	9.9
2.50 *	.15	0	26.3	13.2
↓	.15	5	25.3	12.6
	.15	10	24.6	11.9
	.15	15	23.2	11.3

*For this series of runs $\Delta M/M_o = \dfrac{M_o - (M_o - \Delta M)}{M_o}$

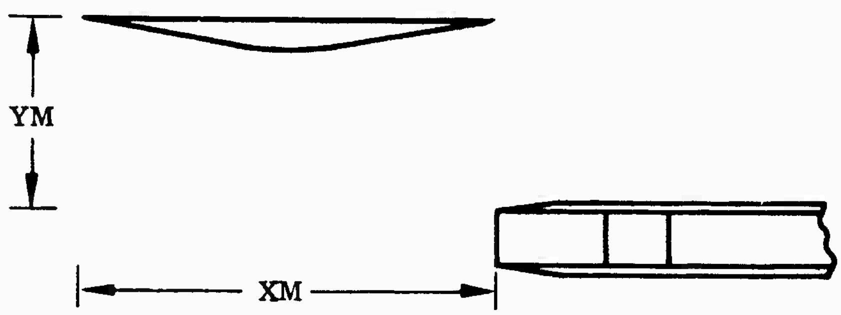
rather than the usual $\Delta M/M_o = \dfrac{(M_o + \Delta M/_2) - (M_o - \Delta M/_2)}{M_o}$

TABLE XII. WEDGE – INLET POSITION, AX INLET



M_o	$\Delta M/M_o$	α, deg.	XM, in.	YM, in.
1.75	.15	0	25.3	11.5
	.20	-5	19.8	7.8
	.20	0	20.6	8.3
	.20	5	21.3	8.8
	.20	10	22.0	9.2
	.20	15	22.6	9.5
2.0	.15	0	27.2	10.9
	.20	0	22.2	8.2
	.20	5	23.2	8.6
	.20	10	23.9	8.9
	.20	15	24.4	9.2
2.25	.20	0	23.9	8.0
	.20	5	24.5	8.3
	.20	10	25.1	8.6
	.20	15	25.5	8.7
2.50	.10	0	43.0	14.8
	.15	0	31.3	10.2
	.20	0	25.4	7.8
	.20	5	26.2	8.0
	.20	-5	24.9	7.5

TABLE XIII. WEDGE – INLET POSITION, 2DE INLET ROTATED 90°



M_0	$\Delta M/M_0$	α, deg.	XM, in.	YM, in.
1.75 ↓	.10	0	19.5	7.1
	.15	0	15.9	4.7
2.0 ↓	.10	0	21.7	7.5
	.10	5	22.4	7.9
	.15	0	16.7	4.7
2.25	.15	0	17.9	4.7
2.50 ↓	.10	0	23.9	6.7
	.15	0	18.6	4.6

TABLE XIV. SUMMARIZED RUN LOG — TRANSONIC UNIFORM FLOW FIELD[1] (PWT-4T)

DATE	PART NO.	MODEL	COWL	M_o	α deg.	β deg.	DEL2, deg.	TBX, in.	COMMENTS
28 Apr. 1970	13-44	2DE	C5		0	0	0	.377	Performance survey at M_o = 0.6, 0.8, and 1.2.
	45-76			0.6			0	.377	Angle of attack study.
	77-102			0.6			-4	.414	Effect of ramp angle/angle of attack study (Part No. 85-102 recorded at R = 4.9 x 10^6).
29 Apr. 1970	106-145			0.8			0	.377	Angle of attack study (tunnel reference dynamic probe in tunnel for Part No. 106-121).
	146-160			0.8			-4		Effect of ramp angle/angle of attack study.
	161-190			1.2			0		Angle of attack study.
30 Apr. 1970	197-225		C7	0.8					Data voided
	229-257								Angle of attack study (R = 4.5 x 10^6).
	258-266				0				Low Reynolds number effect (R = 2.5 x 10^6).
	268-299			1.2					Angle of attack study (R = 4.5 x 10^6).
	300-306			1.2	0				Low Reynolds number effect (R = 2.5 x 10^6).
1 May 1970	309-331		C8	0.8		-4			Effect of sideslip on angle of attack; data recorded at R = 4.5 x 10^6 (Part No. 309 void).
	332-353			1.2		-4			Effect of sideslip on angle of attack.

[1] All data recorded at a nominal Reynolds number per foot of 5.5 x 10^6 except where noted.

TABLE XIV Continued

DATE	PART NO.	MODEL	COWL	M_o	α deg.	β deg.	DEL2, deg.	TBX, in.	COMMENTS
1 May 1970	356-380	2DE	C8	1.2	↗	0	0	.377	Angle of attack study (Part No. 363 voided.
	381-395			1.2	0		↗		Effect of ramp angle.
	396-420			0.8	↗		0		Angle of attack study.
	423-447		C10	0.6	↗				Angle of attack study.
	449-472			0.8	↗				Angle of attack study.
	473-479			0.8	0			0	Throat bleed effect.

TABLE XIV Continued

DATE	PART NO.	MODEL	CONE-COWL	M_o	α deg.	β deg.	CPX, in.	TBX, in.	COMMENTS
2 May 1970	483-415	AX	FC3	0.6	↗	0	4.57	.320	Angle of attack study ($R = 5 \times 10^6$).
	519-540			0.6	↗		4.37		Effect of centerbody position on angle of attack; $R = 5 \times 10^6$ (Part No. 535 and 538 voided).
	541-569			0.8	↗				Angle of attack study.
	570-598			1.2	↗				Angle of attack study.
	601-629		FC1	0.8	↗				Angle of attack study.
	630-663			1.2	↗				Angle of attack study.
	664-665			0.8	0				Additional data points for 601-629 series
	668-696		FC4	0.8	↗		4.37		Angle of attack study.
3 May 1970	697-725			1.2	↗				Angle of attack study.
	728-746			0.8	↗	-4			Effect of sideslip on angle of attack.
	747-756			1.2	↗	-4			Effect of sideslip on angle of attack.
	759-794	AX7		0.6	↗	0	Fixed	.380	Angle of attack study.
	795-830			0.8	↗				Angle of attack study.
	833-868			1.2	↗				Angle of attack study (Part No. 845 voided).
4 May 1970	871-895		SC4	0.8	↗				Effect of splitterplate/angle of attack.
	896-920		SC4	1.2	↗				Effect of splitterplate/angle of attack.

TABLE XIV Concluded

DATE	PART NO.	MODEL	CONE-COWL	M_o	α deg.	β deg.	CPX, in.	TBX, in.	COMMENTS
4 May 1970	923-947	AX7	HC4	0.8	↗	0	Fixed	.380	Effect of half-cone/angle of attack.
	948-975	↓	HC4	1.2	↗	0	Fixed	.380	Effect of half-cone/angle of attack.
	978-1008	AX	FC4	0.8	↗	↓	4.37	.320	Angle of attack study (Repeat of 668-696); Tunnel dynamic pressure recorded in Part No. 978 and 995.
	1009-1041	↓	↓	1.2	↗	↓	↓	↓	Angle of attack study (Repeat of 697-725); Tunnel dynamic pressure recorded in Part No. 1009 and 1027.
	1042-1050	↓	↓	0.6	0	↓	↓	↓	Tunnel dynamic pressure recorded in Part No. 1042; (R = 5.0 x 10^6).
	1053-1078	↓	↓	↗	0	↓	↓	↗	Effect of maximum and zero throat bleed at M_o = 0.8 and 1.2.

TABLE XV. SUMMARIZED RUN LOG — SUPERSONIC UNIFORM FLOW FIELD[1] (VKF-A)

DATE	GROUP NO.	MODEL	COWL	M_o	α deg.	β deg.	DEL2, deg.	TBX, in.	COMMENTS
3 Apr. 1970	1-4	2DE	C5	2.5	0	0	17.2	.320	Scanivalve scan rate study (Group 3 voided).
	5-23				↗			.320	Effect of sidebleed @ α = 0° and selected angles of attack (Groups 7, 9, and 13 voided).
6 Apr. 1970	24-121				↗			↗	Throat bleed study @ α = 0, 5, and 10° (Group 45, 56, 79, 98, 99, and 106 voided).
8 Apr. 1970	122-154			2.0	0		11.4	↗	Throat bleed study (Groups 134 and 150 voided).
	155-175 (187)				5			↗	Throat bleed study (Groups 166, 172, 173, and 175 voided).
9 Apr. 1970	176-196 (except 187)				10			↗	Throat bleed study.
	197-201				0			.350	Low Reynolds Number Study (RE/FT = 1.9×10^6).
	202-236			1.5	↗		0	.181	Angle of attack study.
	237-242			1.5	0		2.0	.181	Effect of ramp angle.
	243-249			2.0	0		8.0	.406	Effect of ramp angle (RE/FT = 7.3×10^6).

[1] All data recorded at a nominal Reynolds number per foot of 5.8×10^6 except where noted.

TABLE XV Continued

DATE	GROUP NO.	MODEL	COWL	M_o	α deg.	β deg.	DEL2, deg.	TBX, in.	COMMENTS
10 Apr. 1970	250-263	2DE	C5	2.0		0	11.4	.350	High angle of attack study, α = 15° and 20° (RE/FT = 7.3 x 10^6).
	264-279		C5	2.5			17.2	.340	High angle of attack study, α = 15° and 20°.
	280-311		C7	2.5			17.2	.340	Angle of attack study.
	312-339			2.0			11.4	.350	Angle of attack study.
	340-353			1.5			0	.181	Angle of attack study.
	354-377		C8	2.0			11.4	.350	Angle of attack study.
	378-380		C8	2.0	0		13.4	.300	Effect of ramp angle.

TABLE XV Continued

DATE	GROUP NO.	MODEL	CONE-COWL	M_o	α deg.	β deg.	CPX, in.	TBX, in.	COMMENTS
13 Apr. 1970	381-392	AX	FC1	2.5	0	0	5.39		Throat bleed study.
	393-398		SC1	2.5			5.39	.270	Effect of splitter plate.
	399-418		FC1	2.0			4.90		Throat bleed study.
	419-432						4.90	.285	Angle of attack study.
	433-440				0				Centerbody position study.
	441-451						4.90		Low Reynolds Number Study (RE/FT = 1.9 x 10^6).
	453-461		SC1						Effect of splitter plate.
	462-478		HC1						Effect of half-cone.
	479-494		FC1	1.5	0		4.57		Throat bleed study.
	495-497				5			.320	Angle of attack effect.
14 Apr. 1970	498-499				0				Without boundary layer trip on centerbody; 498-499 correspond to 479-480, respectively.
	500-501				0				Repeatability check; 500-501 correspond to 479-480, respectively.
	502-503				5				Repeatability check; 502-503 correspond to 495-496, respectively.
	504-524								Angle of attack study.
	525-534				0				Centerbody position study.
	535-543		SC1		0		4.57		Effect of splitter plate.

TABLE XV Continued

DATE	GROUP NO.	MODEL	CONE-COWL	M_o	α deg.	β deg.	CPX, in.	TBX, in.	COMMENTS
14 Apr. 1970	544-553	AX	FC1	2.0	↗	0	5.00	.285	Angle of attack study.
	554-557	↓	↓	2.25	0	↓	5.17	.260	Exploratory study with CPX = 5.17
	558-583			↓	↗		5.27	↗	Throat bleed effect at α = 0 and angles of attack.
	584-593		SCi		0		↓	↗	Throat bleed effect with splitter plate (Group 592 voided).
	594-598		HC1		0			.400	Effect of half-cone.
	599-621		FC4		↗			↓	Angle of attack study.
	622-632		HC4		↗				Half-cone centerbody/angle of attack study.
	633-642		SC4		↗				Splitter plate/angle of attack study.
15 Apr. 1970	643-657		FC4	2.0	0		↗	.285	Centerbody position study.
	658-672		↓	2.0	↗		5.00	.285	Angle of attack study.
	673-708			1.5	↗		4.57	.320	Angle of attack study.
	709-727			2.5	0		↗	.490	Centerbody position study.
	728-734		FC3	2.5	0		5.39	.490	
	735-756		↓	2.25	↗		5.27	.400	Angle of attack study.
	757-794			2.0	↗		5.00	.285	Angle of attack study.
	795-838			1.5	↗		4.57	.320	Angle of attack study.
	839-854		SC3	1.5	↗		4.57	.320	Splitter plate/angle of attack study.

TABLE XV Continued

DATE	GROUP NO.	MODEL	CONE-COWL	M_o	α deg.	β deg.	CPX, in.	TBX, in.	COMMENTS
16 Apr. 1970	855-866	AX7	FC4	2.2	↗	0	Fixed	↗	Throat bleed effect @ α = 0 and 5°.
	867-869	↓	HC4	2.2	0	↓	↓	.40	Effect of half-cone centerbody.
	870-883		FC4	2.0	0			↗	Throat bleed effect.
	884-889		FC4	↓	10			.28	Effect at 10° angle of attack.
	890-898		HC4		↗			.28	Effect of half-cone centerbody @ α = 0 and 10°.
	899-915		FC4	1.5	↗			.38	Angle of attack study.
	916-920		HC4	1.5	0			.38	Effect of half-cone centerbody.

TABLE XV Continued

DATE	GROUP NO.	MODEL	COWL	M_o	α deg.	β deg.	DEL2, deg.	TBX, in.	COMMENTS
25 May 1970	921-938	2DM	--	--	--	--	----	----	All groups voided.
26 May 1970	939-962	↓	↓	7.5	0	0	8.7	↗	Throat bleed study (Groups 957-962 voided).
	963-996	↓	↓	--	--	--	----	----	All groups voided.
27 May 1970	997-1032	2DE	C5	7.5	↗	0	17.2	.340	Angle of attack study; α= 0, 5, and 10° data are repeat of earlier test points (Groups 24-121).
	1033-1067	↓	↓	2.5	↗	↓	16.5	.340	Effect of ramp angle on angle of attack.
	1068-1075	↓	↓	2.0	0	↓	11.4	.350	Repeat of earlier test series (Groups 122-154).
	1076-1115	↓	↓	↓	↗	↓	13.4	↓	Effect of ramp angle on angle of attack.
	1116-1153	↓	↓	↓	↗	↓	8.0	↓	Effect of ramp angle on angle of attack; Group 1116 @ α = 4° instead of 0°.
	1154-1161	↓	↓	1.5	0	↓	0	.181	Repeat of earlier test series (Groups 202-211).
	1162-1188	↓	↓	↓	↗	↓	2°	↓	Effect of ramp angle on angle of attack.
	1189-1203	↓	↓	↓	↗	-4	0	↓	Angle of attack study at fixed sideslip.
	1204-1218	↓	↓	2.0	↗	↓	11.4	.350	Angle of attack study at fixed sideslip.
	1219-1233	↓	↓	2.5	↗	↓	17.2	.340	Angle of attack study at fixed sideslip.

TABLE XV Concluded

DATE	GROUP NO.	MODEL	COWL	M_o	α deg.	β deg.	DEL2, deg.	TBX, in.	COMMENTS
29 May 1970	1234-1259	2DE	C8	2.5	↗	0	17.2	.340	Angle of attack study.
	1260-1282	↓	↓	1.5	↗	↓	0	.181	Angle of attack study.
	1283-1288	↓	↓	1.5	0	↓	0	.181	Effect at zero ramp bleed.
1 Jun. 1970	1289-1312	2DM	--	3.0	0	↓	12	↗	Throat bleed study.
	1313-1335	↓	↓	↓	↗	↓	12	.410	Angle of attack study.
	1336-1340	↓	↓	↓	0	↓	10	.410	Effect of ramp angle.
	1341-1359	↓	↓	2.25	↓	↓	↗	.527	Effect at ramp angle (Groups 1358 and 1359 tested with TBX = .577).
	1360-1372	↓	↓	↓	↓	↓	2.4	↗	Throat bleed study.
	1373-1394	↓	↓	↓	↗	↓	2.4	.353	Angle of attack study (Group 1388 voided).
	1395-1428	↓	↓	2.5	↗	↓	8.7	.410	Angle of attack study.
2 Jun. 1970	1429-1438	↓	↓	2.5	0	↓	↗	.410	Effect of ramp angle.
	1439-1451	↓	↓	1.5	0	↓	0	↗	Throat bleed study.
	1452-1471	↓	↓	1.5	↗	↓	0	.368	Angle of attack study.

TABLE XVI. SUMMARIZED RUN LOG — SUPERSONIC NONUNIFORM FLOW FIELD[1] (VKF-A)

DATE	GROUP NO.	MODEL	M_o	α deg.	β deg.	DEL2, deg.	TBX, in.	$\Delta M/M_o$	COMMENTS
15 Oct. 1970	3-14	2DE	2.5	0	0	17.2	.340	-	Data repeatability check with previous test series.
16 Oct.	15-53	↓	2.25	↗	↓	14.6	.350	↓	Angle of attack study (Group 45 voided).
	54-65	↓	2.25	0	↓	↗	↓	↓	Effect of ramp angle.
	66-71	↓	2.0	0	↓	11.4	↓	↓	Data repeatability check with previous test series (Group 66 voided).
19 Oct.	72-98	2DEV	2.0	↗	↓	↓	↓	↓	Effect of vortex generator configuration with angle of attack. Flexible curtain separating throat and ramp bleed plenums separated during this test series.
21 Oct.	99-109	2DEV	↓	0	↓	↓	↓	↓	Repeat of 72-83 (α = 0).
	110-117	2DEVI	↓	0	↓	↓	↓	↓	Alternate vortex generator configuration
	118-144	2DE	↓	↗	↓	↓	↓	↓	Data repeatability check with previous test series.
	145-155	↓	1.5	↗	↓	0	.180	↓	Data repeatability check with previous test series.
	156-168	↓	1.75	↗	↓	7.2	.270	↓	
28 Oct.	169-179	↓	↗	-	-	-	-	-	Flow field survey with wedge installed at different Mach numbers.
	180-183	↓	2.0	0	0	11.4	.350	↗	Flow field survey with model installed.

[1] All data recorded at a nominal Reynolds number per foot of 5.8×10^6.

TABLE XVI Continued

DATE	GROUP NO.	MODEL	M_o	α deg.	β deg.	DEL2, deg.	TBX in.	$\Delta M/M_o$	COMMENTS
29 Oct. 1970	184-203	2DE	2.0	0	0	11.4	.350		Flow field survey with model installed.
	204-216							.20	Effect of ramp angle with fixed gradient.
	217-241							.20	Angle of attack study with fixed gradient.
	242-254							.15	Angle of attack study with fixed gradient.
30 Oct.	255-257		2.5	0		17.2	.340		Flow field survey with model installed.
	258-287			0		17.2			Effect of Mach number gradient.
	288-305 (316-319)			10				.20	Effect of ramp angle at α = 10° with fixed gradient.
	306-315 (320-324)			15					Effect of ramp angle at α = 15° with fixed gradient.
2 Nov.	325-340			5					Effect of ramp angle at α = 5° with fixed gradient.
	341-349		2.25	0		14.6	.350	.15	
	350-352		2.25	0					Flow field survey with model installed.
	353-391							.20	Angle of attack study with fixed gradient.
3 Nov.	392-395		1.75	0		7.2	.270		Flow field survey with model installed
	396-415			0					Effect of Mach number gradient.
	416-429							.20	Angle of attack study with fixed gradient.
	430-443		2.0	0		11.4	.350		Effect of Mach number gradient.
4 Nov.	444-468	2DEI	2.5			17.2	.340		Effect of Mach number gradient.
	469-478		2.5			16.5	.340	.20	Effect of ramp angle.
	479-498		2.25			14.6	.350		Effect of Mach number gradient.
5 Nov.	499-518		2.25				.350	.20	Effect of ramp angle with fixed gradient.
	519-560		2.5			17.2	.340	.15	Angle of attack study with fixed gradient.

TABLE XVI Continued

DATE	GROUP NO.	MODEL	M_o	α deg.	β deg.	DEL2, deg.	TBX in.	M/M_o	COMMENTS
6 Nov. 1970	561-281	2DEI	2.0	0	0	11.4	.350	↗	Effect of Mach number gradient.
	582-591			↓		8.0		.20	Effect of ramp angle at fixed gradient.
	592-627			↗		11.4		.15	Angle of attack study at fixed gradient.
	628-632		↓	0		13.4	↓	.20	Effect of ramp angle at fixed gradient.
	633-651	↓	1.75			7.2	.270	↗	Effect of Mach number gradient.
9 Nov.	652-668	2DEN[1]	2.5			17.2	.340	↗	Effect of Mach number gradient.
	669-672		2.25			14.6		.15	
	673-684		2.0	↓		11.4		↗	Effect of Mach number gradient.
	685-689		2.0	5		11.4		.10	Effect of sideslip*
	690-701	↓	1.75	0		7.2	↓	↗	Effect of Mach number gradient.
10 Nov.	702-712	AX	2.5			5.39[2]	.490	↗	Flow field survey with model installed. (Groups 702-706 voided)
	713-736			↓				↗	Effect of Mach number gradient
	737-752			↗		↓		.20	Angle of attack study with fixed gradient.
12 Nov.	753-769		↓	0		↗	↓	.20	Effect of centerbody position with fixed gradient.
	770-775		2.25	0		5.27	.400	↗	Flow field survey with model installed.
	776-808			↗		5.27		.20	Angle of attack study with fixed gradient
	809-828		↓	0		↗	↓	.20	Effect of centerbody position with fixed gradient.
	829-835		2.0			5.00	.360	↗	Flow field survey with model installed.
	836-867	↓	↓	↓	↓	↗	↓	.20	Effect of centerbody position with fixed gradient. (Group 857 voided)

[1] For the 2DEN configuration (model rolled + 90° from upright), α and β are relative to the tunnel support system. For all other configurations, α and β are identified with the upright model attitude convention.

[2] For the AX inlet the column refers to centerbody position (CPX) in inches.

TABLE XVI Concluded

DATE	GROUP NO.	MODEL	M_0	α deg.	β deg.	CPX in.	TBS in.	$\Delta M/M_0$	COMMENTS
	868-867	AX	2.0	0	0	5.00	.360	.15	Effect of Mach number gradient.
	878-902		2.0	↗		4.85	.360	.20	Angle of attack study with fixed gradient.
14 Nov.	903-908		1.75	0		4.80	.320	↗	Flow field survey with model installed.
	909-929					↗	.320	.20	Effect of centerbody position with fixed gradient.
	930-938					4.80		>.15	Effect of Mach number gradient.
	939-975			↗				.20	Angle of attack study with fixed gradient (Group 957 voided).
	976-983			0				.15	Effect of Mach number gradient.
	984-996			↗	-4			.20	Effect of sideslip on angle of attack with fixed gradient.
	997-1002		2.0	0		5.00	3.60	.20	Effect of sideslip with fixed gradient.
	1003-1012		2.0	↗		4.85	3.60	.20	Effect of sideslip on angle of attack with fixed gradient.
16 Nov.	1013-1020		2.5	0	0	5.39	.490	-	
	1021-1028		2.5	5		5.24	.490		
	1029-1038		2.25	0		5.27	.400		
	1039-1044		2.25	10		5.12	.400		
	1045-1082		1.75	↗		4.80	.320		Angle of attack study.
17 Nov.	1083-1091		2.0	0		5.00	.360		
	1092-1099		2.0	10		4.85	.360		
	1100-1108		1.5	0		4.80	.320		
	1109-1118		1.5		-4	4.80	.320		Effect of sideslip.
	1119-1129		2.5			4.39	.490		Effect of sideslip.
	1130-1140		2.25			5.27	.400		Effect of sideslip (Group 1134 voided)
	1141-1148		2.25	10		5.12	.400		Effect of sideslip at $\alpha = 10°$.
	1149 1158		2.00	0		5.00	.360		Effect of sideslip
	1159-1173		2.0	↗		4.85	.360		Effect of sideslip on angle of attack.

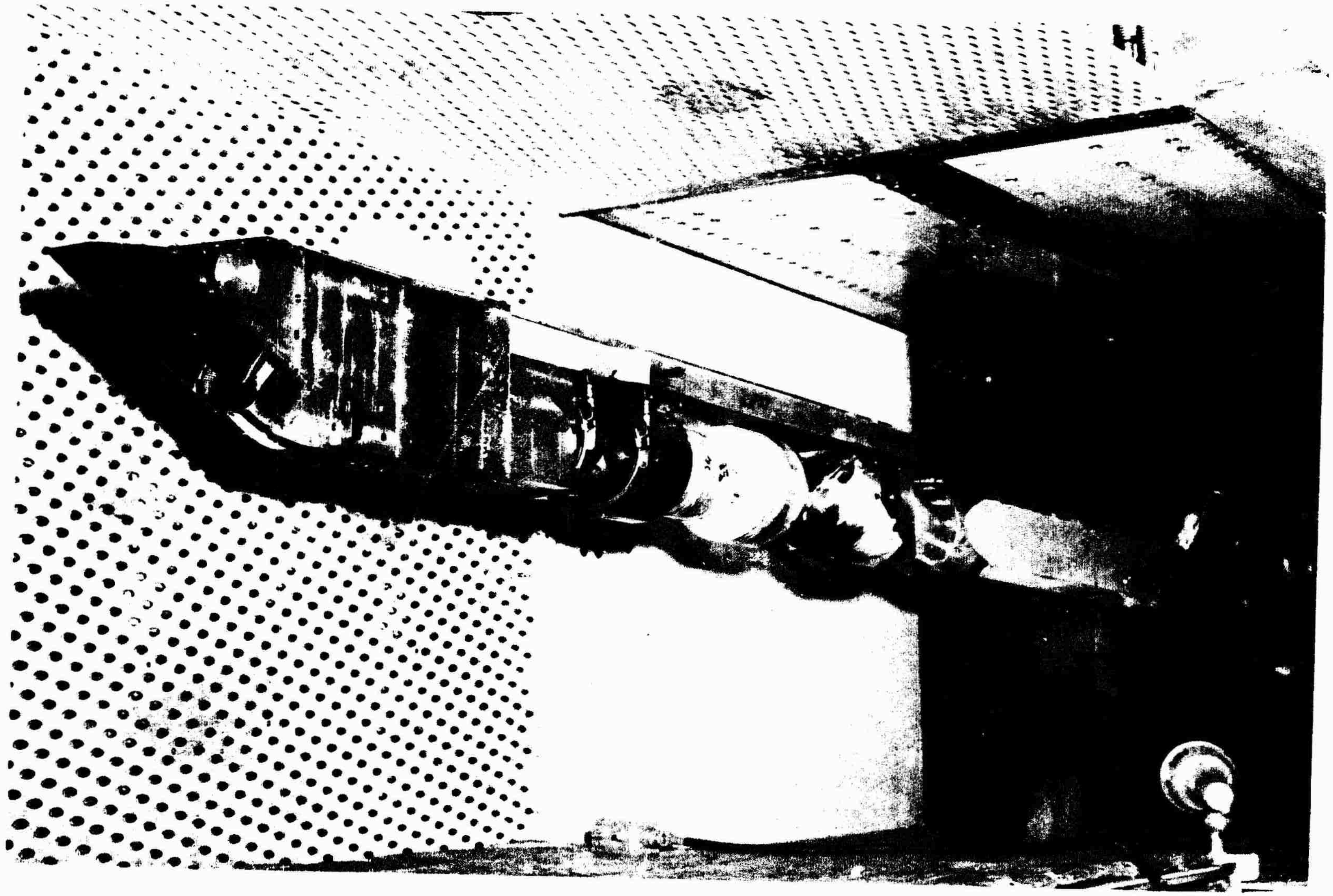


Figure 14. Two-Dimensional External-Compression Inlet (2DE) Installed in PWT-4T Transonic Wind Tunnel

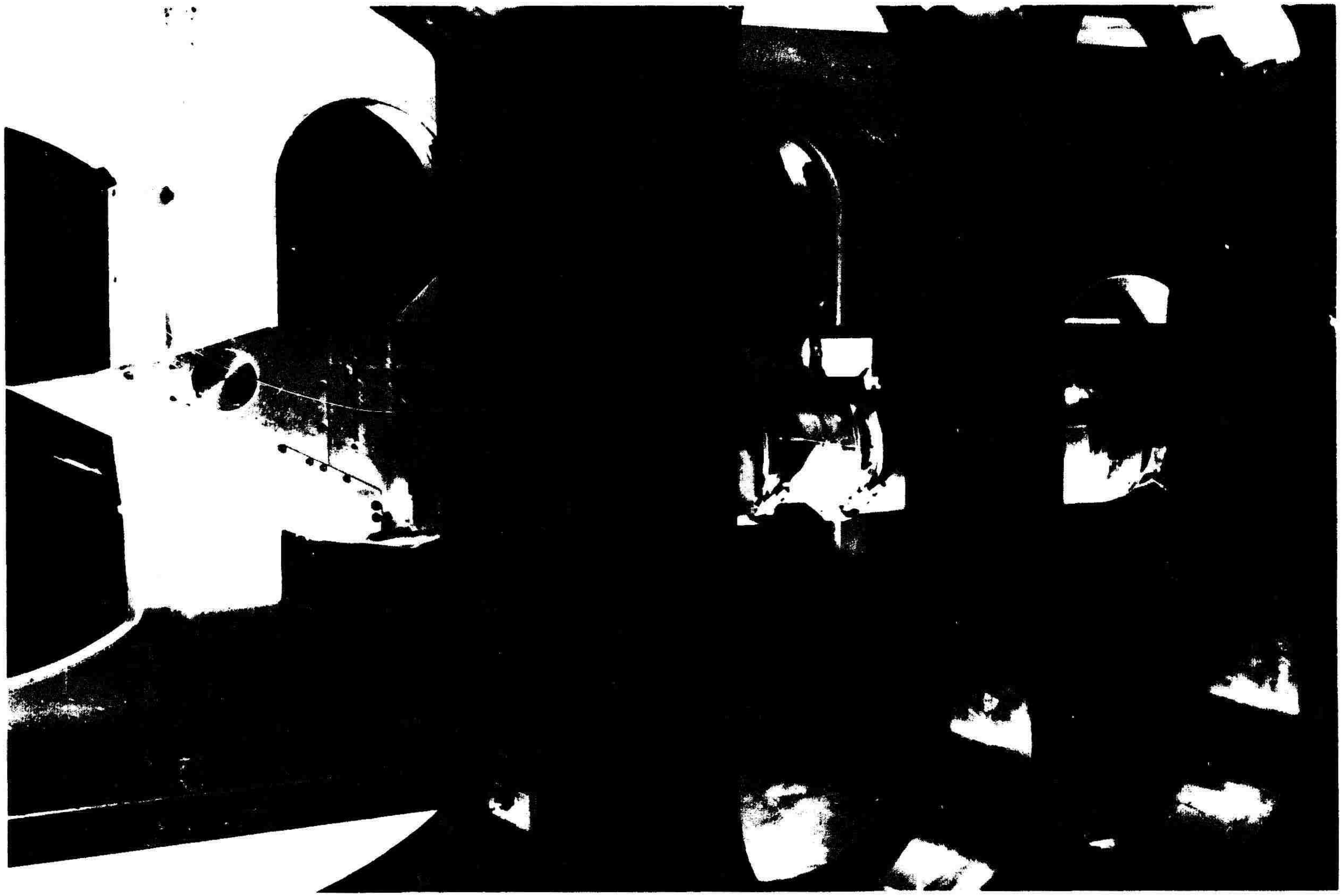


Figure 15. Two-Dimensional External-Compression Inlet (2DE) Installed in VKF-A Supersonic Wind Tunnel

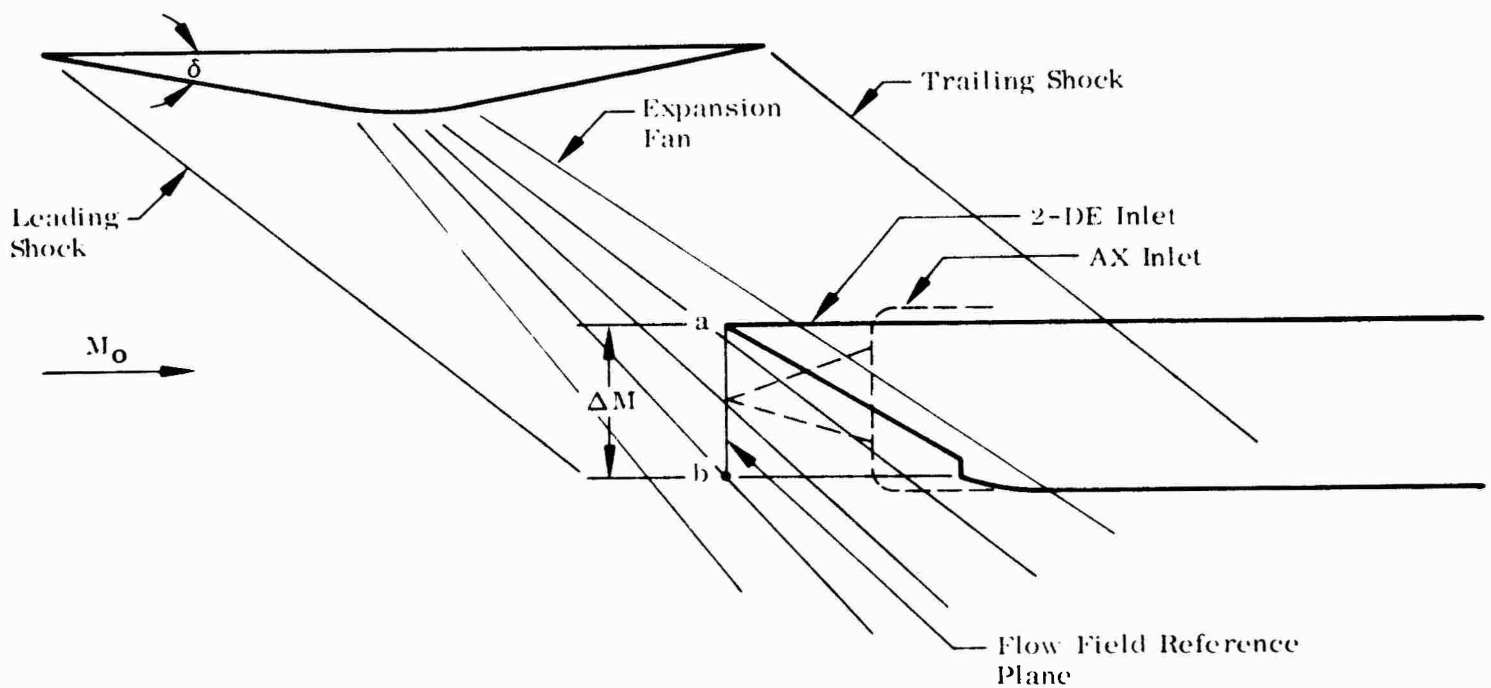


Figure 16. Model Arrangement for Nonuniform Flow Field Tests

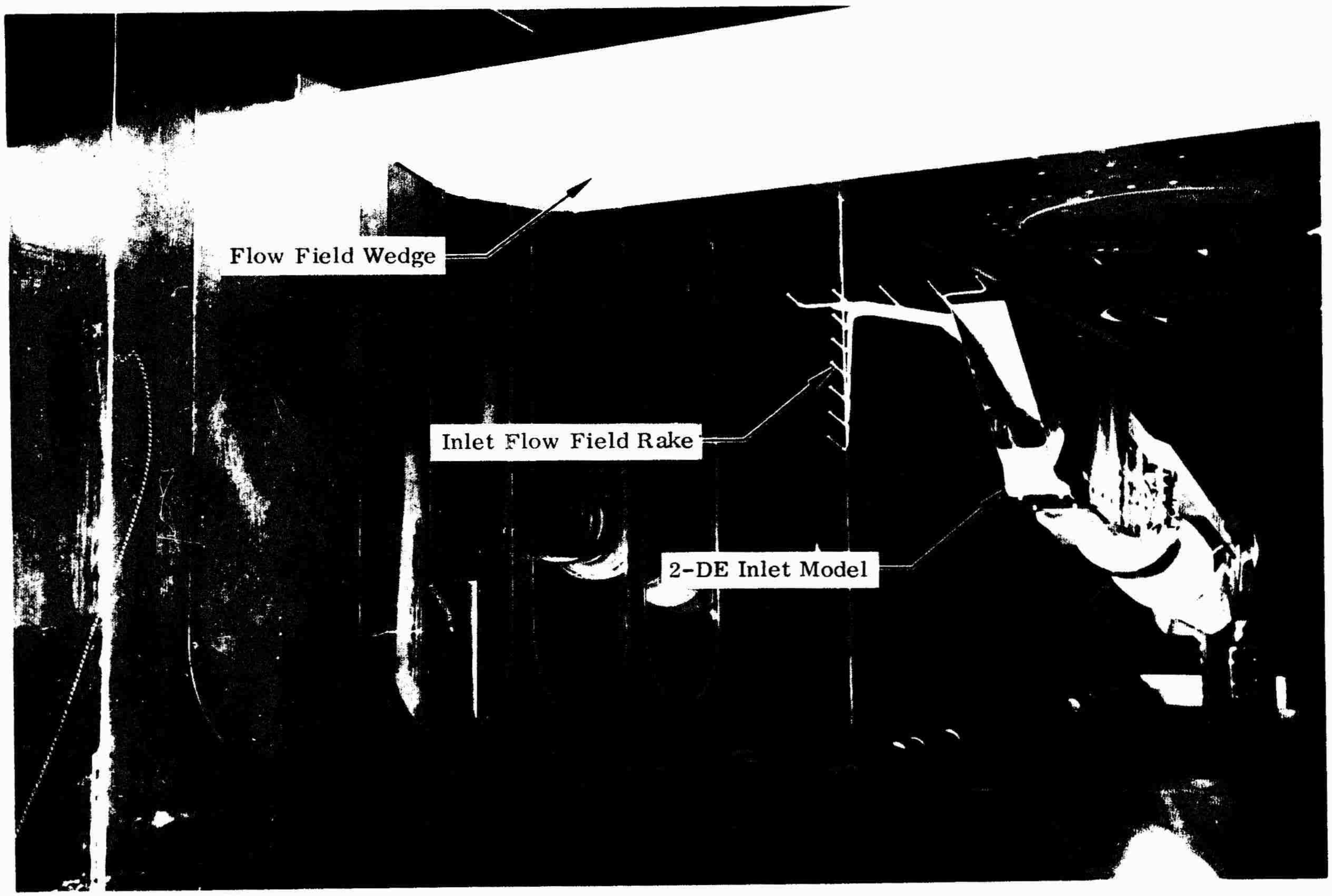


Figure 17. Two-Dimensional External-Compression Inlet (2DE) and Flow Field Wedge Installed in VKF-A Supersonic Wind Tunnel

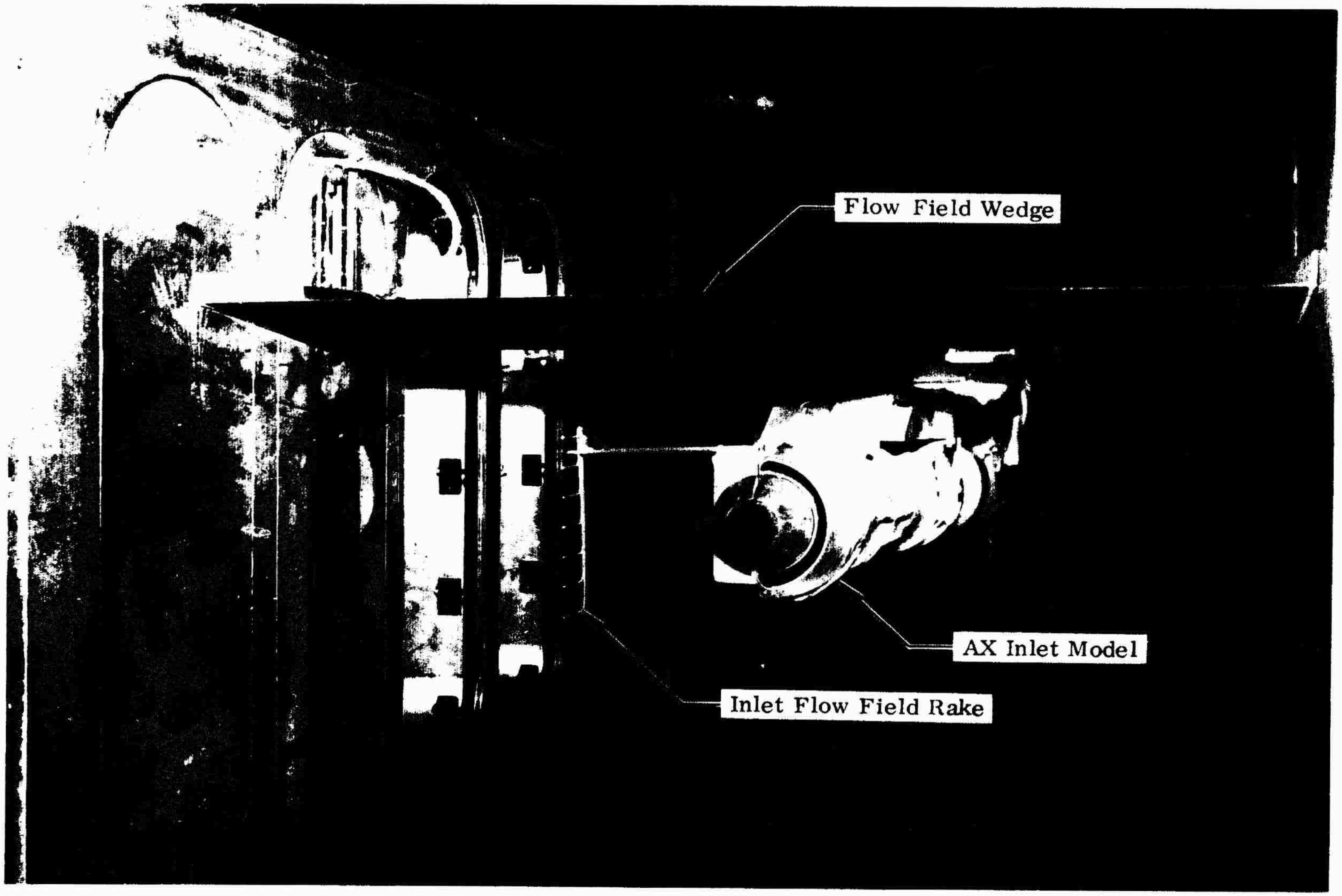


Figure 18. Half-Axisymmetric External-Compression Inlet (AX) and Flow Field Wedge Installed in VKF-A Supersonic Wind Tunnel

SECTION IV

TEST DATA

Data Presentation

The tabulated data are documented on seven rolls of microfilm and are included in the Appendix of this report. Identification of the individual rolls is presented in Table XVII. There are three basic formats of data presentation corresponding to the uniform approaching supersonic flow field tests at the VKF-A facility (roll numbers 1, 2 and 3), uniform approaching transonic flow field tests at the PWT-4T facility (roll numbers 4 and 5), and the nonuniform approaching supersonic flow field tests at the VKF-A facility (roll numbers 6 and 7). Samples of the various tabulated data formats appearing in the seven rolls are presented in Figures 19 through 21 and discussed below. Nomenclature used in the data formats shown for the VKF-A tunnel in Figures 19 and 21 are presented in Table XVIII. Nomenclature for PWT-4T tunnel tabulated data formats shown in Figure 20 are presented in Table XIX.

In roll numbers 1-3, there are two basic types of runs (group number). The first consists of all pressure measurements (excluding the movable rake) and the primary performance parameters derived from these pressure measurements. These data are presented on three tabbed sheets as shown in Figures 19a, 19b and 19c for the 2DE inlet. The second type of data consists of pressure measurements made by the movable rake at the various traversed positions and the local performance parameters derived from these pressure measurements. These data are presented on one tabbed sheet as shown in Figure 19d for the 2DE inlet. The data for the AX and 2DM inlets appearing in roll numbers 2 and 3, respectively, are similar in format to the sample data illustrated for the 2DE inlet, except that the movable rake data for the AX inlet are presented for different rake sweep angles rather than the traversed distances as for the 2D inlets.

The transonic data presented in roll numbers 4 and 5 also consist of two basic types of run (part number) as above. The primary pressure measurements and performance parameters are presented on two tabbed sheets as shown on Figures 20a and 20b for the 2DE inlet. The movable rake data and rake station performance parameters are presented on one tabbed sheet as shown in Figure 20c for the 2DE inlet. The

AX data on roll number 5 have a similar format. Note that no transonic data were obtained with the 2DM inlet.

The nonuniform approaching supersonic flow field inlet data presented on roll numbers 6 and 7 follow a similar format as that used on rolls 1, 2 and 3 except for the addition of the flow survey rake data which measures the local Mach number gradient. The primary pressure data and performance parameters are presented on three tabbed sheets as shown in Figures 21a, 21b, and 21c for the 2DE inlet. The Mach number gradient data are presented on the third page. The movable rake data are presented on Figure 21d. The AX data follow a similar format. In addition to the inlet data, detailed mapping of the nonuniform flow field with the wedge mounted rakes (Figure 13a) are presented on a single tabbed sheet for each Mach number. An example of this format is presented in Figure 22.

It should be noted that some of the tabbed sheets also include data related to the operation of the tunnel which are not identified in the nomenclature section. All data which have a direct effect on the calculation of tunnel parameters, such as Mach number, Reynolds number, etc., are included in the nomenclature section.

Tables XX through XXII present summaries of data errors and bad coded pressures in the tabulated data. The bad coded pressures refer to erroneous pressures removed from the calculation of performance parameters. The more detailed summaries for the supersonic data (Tables XX and XXII) were provided by the AEDC-VKF Tunnel A Facility. The condensed summary for the transonic data (Table XXI) presents only the data errors which directly influence the derived inlet performance parameters or the dynamic RMS pressures.

Configuration Run Summary

A summary of the configurations tested and the corresponding run numbers is presented in Tables XXIII through XXV to aid the reader in isolating the data of interest from the microfilms. Table XXIII presents a summary of the configurations tested for data appearing in microfilm roll numbers 1, 2 and 3; i.e., for the uniform approaching supersonic flow field. Similarly, Tables XXIV and XXV correspond to the transonic data (microfilm roll numbers 4 and 5) and uniform/nonuniform supersonic data (microfilm roll numbers 6 and 7), respectively. The tables are arranged such that for a given configuration, model attitude, and freestream conditions, the run numbers for the range of mass flow ratio tested are presented. In addition, the run numbers are divided into two groups corresponding to the primary performance data (at the compressor face) and the movable rake data.

TABLE XVII. MICROFILM DATA SUMMARY

Roll Number	Type of Data	Data Group or Part Numbers	AEDC Project Number
1	2DE uniform supersonic	1-380 997-1288	VKF-VA0926
2	AX uniform supersonic	381-920	VKF-VA0926
3	2DM uniform supersonic	921-996 1289-1471	VKF-VA0926
4	2DE uniform transonic	13-479	PWT-PC-0029
5	AX uniform transonic	483-1078	PWT-PC-0029
6	2DE uniform/nonuniform supersonic	1-701	VKF-VA0154
7	AX uniform/nonuniform supersonic	702-1173	VKF-VA0154

TABLE XVIII. TABULATED DATA FORMAT NOMENCLATURE — VKF-A TUNNEL

Run Identification	
CONFIG	Configuration number 1 - 2DE 2 - 2DM 3 - AX WEDGE - Wedge flow field
GRP, GROUP	Group Number
PROJ, PROJECT	ARO project number
Tunnel Conditions	
MACH NO, MACH	Tunnel freestream Mach number
MUINF	Freestream viscosity, $lb\text{-}sec/ft^2$
PINF	Freestream static pressure, psia
PO AVG	Average tunnel stagnation pressure, psia (for data loops taken from taps 101 → 130)
PREF, PSREF	Reference pressure, psia
QINF	Freestream dynamic pressure, psi
RE/FT	Freestream Reynolds number $X10^{-6}$
RHOINF	Freestream density, $slugs/ft^3$
TINF	Freestream static temperature, °R
TO	Tunnel total temperature, °R
VINF	Freestream velocity, ft/sec
Model Components and Model Position	
AC	Model capture area, in^2
ALPHA-S	Sector angle of attack, deg. (ALPHA-S = -4.0 deg. when ALPHA-M1 = 0).
ALPM-ALPHA-M	Model angle of attack (based on sector angle), deg.
ALP2, ALPHA-M1	Model angle of attack (based on angle indicator), deg.
ALPM(CORR), ALPHA-M2 ALP2(CORR)	Model angle of attack corrected for side slip angle, deg.
BETA, BETA-M1	Model sideslip angle, deg.
BETA-M2	Model sideslip angle corrected for angle of attack, deg.
CPX	Distance from AX centerbody tip to cowl lip, in.
CR	Sector center of rotation, in.
DEL2	Second ramp angle relative to first ramp. deg.
L	Reference length, 28 in.
MBX	Mass flow plug position, in.
TBX	Throat bleed plate, position, in.
THETA	AX movable rake circumferential location measured from 12 o'clock position, deg.

TABLE XVIII. (Concluded)

X	Axial distance from throat to pressure orifice, in.
XM	Axial distance between wedge and inlet based on ALPM, in.
XM2	Axial distance between wedge and inlet based on ALP2, in.
XS	Sector axial position, in.
YM	Vertical distance between wedge and inlet based on ALPM, in.
YM2	Vertical distance between wedge and inlet based on ALP2, in.
YW	Vertical distance between wedge and tunnel center line, in.
Z	Movable rake position measured from diffuser ramp, in.

Inlet Performance

CFR	Compressor face pressure recovery
CP	Pressure coefficient
DICF	Compressor face pressure distortion
DIT	Movable rake station pressure distortion
MI	Local Mach number
MINF	Tunnel freestream Mach number
P	Measured pressure, psia
PTCF	Compressor face average pressure, psia
RMS	Root mean square of pressure fluctuation, psi (see Table 2-5 for instrumentation definition)
(RMSCF)AVG	Compressor face average turbulence
(RMST)OAVG/TRR•PO	Movable rake station average turbulence
TAP	Pressure orifice number (see Tables 2-1 through 2-4)
TRR	Movable rake station pressure recovery
WBC	Cowl bleed mass flow, lbs/sec
WBR	Ramp bleed mass flow, lbs/sec
WBT	Throat bleed mass flow, lbs/sec
WBS1	Forward side plate bleed mass flow, lbs./sec.
WBS2	Aft side plate bleed mass flow, lbs/sec.
WC	Capture area mass flow, lbs/sec.
WCF	Compressor face mass flow, lbs/sec.
(WCF)CORR	Corrected compressor face mass flow, lbs/sec.
WO	Total inlet mass flow, lbs/sec

TABLE XIX. TABULATED DATA FORMAT NOMENCLATURE — PWT-4T TUNNEL

Run Identification

INLET	Inlet configuration, AX or 2DE.
PART	Part number.
POINT	Data Point, each time transducers are read for given part number.
TEST	PWT-4T project number.
TIME	Hour, minute, second.

Tunnel Conditions

M1	Tunnel freestream Mach number.
P1	Freestream static pressure, psfa.
PTA-1	Freestream total pressure, psfa.
Q1	Freestream dynamic pressure, psf.
RX10-6	Freestream Reynolds number, 1/ft.

Model Components and Model Position

ALF-D	Model angle of attack, deg.
ALF-M	Model angle of attack corrected for sideslip, deg.
AXR	AX movable rake circumferential location measured from 12 o'clock position, deg.
BET-M	Model angle of sideslip, deg.
CPX	Distance from AX centerbody tip to cowl lip, in.
CPX-RC	CPX referred to cowl radius.
DEL-2	Second ramp angle relative to first ramp, deg.
MBX	Mass flow plug position, in.
MODEL STA.	Model station.
TBX	Throat bleed plate position, in.
2DR	Movable rake position measured from diffuser ramp, in.

Inlet Performance

CF-AVE	Compressor face pressure recovery.
CP	Pressure coefficient.
DICF	Compressor face pressure distortion.
DIT	Movable rake station pressure distortion.
MFR-BR	Ramp bleed mass flow ratio.
MFR-BS1	Side plate bleed mass flow ratio.
MFR-BT	Throat bleed mass flow ratio.
MFR-CF	Compressor face mass flow ratio
MFR-0	Inlet mass flow ratio.

TABLE XIX. (Concluded)

NRMS	PRMS referred to compressor face pressure (see table 2-5 for instrumentation definition)
P	Measured pressure, psfa.
P/PTA	Measured pressure referred to tunnel total pressure.
P-REF	Flow metering reference pressure
PRMS	Root-mean-square of pressure fluctuation, psi (see Table 2-5 for instrumentation definition)
RK	Movable rake average pressure ratio at a given location
RK-AVE	Average pressure of 2 or more rake locations; average pressure at movable rake station when 5 rake locations are averaged.
RMST	Movable rake average turbulence, at a given location.
TAP	Pressure orifice number (see Tables 2-1 through 2-4)
T-AVE	Average turbulence of 2 or more rake locations; average turbulence at movable rake station when 5 rake locations are averaged.
WBR	Ramp bleed mass flow, lbs/sec.
WBS1	Side plate bleed mass flow, lbs/sec.
WBT	Throat bleed mass flow, lbs/sec.
WC	Capture area mass flow, lbs/sec.
WOAX	Total inlet flow, AX inlet
WO2DE	Total inlet flow, 2DE inlet

TABLE XX. DATA ERRORS AND BAD CODED PRESSURES – SUPERSONIC UNIFORM FLOW FIELD (VKF-A)

2DE INLET

Group Number	Remarks
1 → 920	Taps 85 and 135 are wrong.
1 → 91	Taps 80, 81, 82 and 84 are wrong.
3	Omitted - Gp 15 was a repeat.
9	Tap 124 bad coded.
11	Tap 73 and 83 are wrong.
17	Has two loops at the same Z location.
32	Omitted
56	Taps 94 and 95 are wrong.
79	Omitted - Gp 80 was a repeat.
98	Omitted - Gp 101 was a repeat.
99	Omitted
106	Omitted - Gp 121 was a repeat.
113	Taps 48 and 143 are wrong.
150	Omitted - Gp 152 was a repeat.
173	Taps 27 and 45 are wrong.
175	Taps 7 and 8 are wrong.
197 → 200	Tap 100 is wrong.
224 → 230	Tap 100 is wrong.
231	Has two loops at the same Z location and tap 100 is wrong.
232 → 249	Tap 100 is wrong.
250 → 263	Tap 119 bad coded. Tap 100 is wrong.
264 → 279	Tap 125 bad coded.
280 → 282	Taps 115 and 125 bad coded. Taps 26 and 66 are wrong.
283	Omitted
284 → 287	Taps 115 and 125 bad coded. Taps 26 and 66 are wrong.
288	Taps 115, 124 and 125 bad coded. Taps 26 and 66 are wrong.
289 → 311	Taps 115 and 125 bad coded. Taps 26 and 66 are wrong.
312 → 328	Tap 115 bad coded. Taps 26 and 66 are wrong.
329	Taps 114, 115 and 125 bad coded. Taps 26 and 66 are wrong.
330 → 344	Tap 115 bad coded. Taps 26 and 66 are wrong.
345	Taps 115 and 123 bad coded. Taps 26 and 66 are wrong.
346 → 354	Tap 115 bad coded. Taps 26 and 66 are wrong.
355 → 365	Tap 115 bad coded.
366	Omitted - bad paper tape.
367 → 380	Tap 115 bad coded.
997 → 1288	Dynamic transducers Nos. 5 and 12 and Tap 108 bad coded.
997 → 1233	Tap 100 was leaking.
1157	Tap 74 is wrong.
1234 → 1288	Tap 102 bad coded.
1244	Tap 113 is one psi low.
1154 → 1198	Dynamic transducer No. 1 not working.

NOTE: Bad coded pressures not used in calculation of performance parameters.

TABLE XX. (Continued)

AX INLET

Group No.	Remarks
381 → 920	Taps 115, 125 and 135 bad coded.
381 → 854	Taps 35 and 36 are reversed.
382 → 393	Tap 30 is wrong.
452	Omitted
459	Omitted
468 → 497	Tap 54 is wrong and is replaced with Tap 53 in the calculations.
592	Omitted - out of sequence.
643 → 854	Tap 53 is wrong and is replaced with Tap 52 in the calculations.
733	Tap 105 bad coded.
764 → 828	Tap 100 is wrong.
829 → 854	Taps 65 and 100 are wrong.
855 → 920	Taps 21, 23, 40, 41 and 42 are wrong. Tap 116 bad coded.
858	Omitted
861	Omitted

NOTE: Bad coded-pressures not used in calculation of performance parameters.

TABLE XX. (Concluded)

2DM INLET

Group No.	Remarks
921 → 1471	Dynamic Transducers Nos. 5 and 12 and Tap 108 bad coded.
921 → 996	Tap 100 is wrong.
1289 → 1471	Tap 102 bad coded. Tap 7 was leaking.
1334 → 1471	Tap 44 was leaking.
1388	Omitted
1458	Omitted
1439 → 1471	Dynamic Transducer No. 1 not working.

NOTE: Bad coded-pressures not used in calculation of performance parameters.

TABLE XXI. DATA ERRORS AND BAD CODED PRESSURES — TRANSONIC UNIFORM FLOW FIELD (PWT-4T)

Part Number	Remarks
13-1078	Dynamic Transducer No. 8 inoperative for entire test
13-1078	Tap 118 bad coded
25	Tap 116 leaking - error included in calculation of PTCF/PTO
28-121	Tap 116 bad coded
28-1078	Dynamic Transducer No. 9 inoperative
229-1078	Dynamic Transducer No. 5 bad coded
326	Tap 103 leaking - error included in calculation of PTCF/PTO
328-477	Tap 103 bad coded
697-1078	Dynamic Transducer No. 11 inoperative
1053-1078	Tap 130 bad coded

NOTE: Bad coded-pressures not used in calculation of performance parameters.

TABLE XXII. DATA ERRORS AND BAD CODED PRESSURES – SUPERSONIC NONUNIFORM FLOW FIELD (VKF-A)

2DE INLET WITHOUT WEDGE

Group No.	Remarks (Numbers refer to pressure taps)
1 and 2*	Wrong - tanks leaked
1 → 98	72, 74, 81 and 82 leaked
1 → 19	52, 110 and 119 bad coded
20 → 33	52 bad coded and 82, 131 and 110 leaked
34 → 71	110 bad coded
39 → 99	4, 5, 6 and 7 leaked
57 → 60	106, 111, 121, 135 and 136 were bad coded. However, they are correct.
66 → 71*	All data on valve #2 is bad.
98 → 168	1 and 81 leaked
106	101 bad coded
112 → 168	RMS 5 bad coded
121	23, 27, 136 and 138 bad and 117 bad coded
123	103 bad coded
129 → 168	RMS 8 is bad

*Performance parameters are incorrect.

NOTE: Bad coded-pressures not used in calculation of performance parameters.

TABLE XXII. (Continued)

2DE INLET WITH WEDGE

Group No.	Remarks (Numbers refer to pressure taps)
180 → 701	81 and 85 leaked
180 → 254	48 leaked
183*	Reflected wedge bow shock forward of inlet
183 and 184	RMS 8 is wrong
185 → 192	RMS 5 is bad coded
236*	Pressures are approximately 4 psi low
230	113 bad coded
233 → 254	RMS 4 bad coded
255 → 306	28 leaking
266	94 bad point
302	124 bad coded
322	122 bad coded
351	45 bad point
389	48 bad point
392 → 443	45 and 132 leaked
400 → 443	RMS 2 bad coded
419	94 bad point
432	137 bad coded
444 → 701	1 leaking: On board α indicator failed, α_2, x_{m2} and y_{m2} wrong
455	53 (loop 5) bad coded
472	48 bad point
492	53 (loop 2) bad coded
494	53 (loops 4 and 5) bad coded
499 → 502	53 (all loops) bad coded
514	101 bad coded
525	111 bad coded
541	94 bad point
548	104 bad coded
561 → 701	105 bad coded (tube broken)
575	RMS 8 bad point
624*	Has only four loops
631	131 bad point
652 → 701	RMS 4 bad coded
659	7 bad point
701	52 (loop 6) bad coded

*Performance parameters are incorrect.

NOTE: Bad coded-pressures not used in calculation of performance parameters.

TABLE XXII. (Continued)

AX INLET WITH WEDGE

Group No.	Remarks (Numbers refer to pressure taps)
702 → 1012	8 was not measured and 105 bad coded
702 → 902	Onboard α indicator failed: α_2, x_{m2}, and y_{m2} - wrong
702 → 706	210 → 216 were plugged
710	111 bad coded
768	137 bad coded
775	104 and 123 bad coded
777	131 bad point
788	43 bad point
792	124 bad coded
794	114 bad coded
815	125 bad coded
847, 857, 867	Scanner problem - these groups were lost
872	44 bad point
943	115 bad coded
962	51 (loops 1 and 4) bad coded
968 → 1012	RMS 13 bad coded
984 → 1012	210 → 216 were not measured
975	51 (loop 2) bad coded
1010	104 bad coded

NOTE: Bad coded-pressures not used in calculation of performance parameters

TABLE XXII. (Concluded)

AX INLET WITHOUT WEDGE

Group No.	Remarks (Numbers refer to pressure taps)
1013 → 1173	8 was not measured, 105 was bad coded and RMS 13 was bad coded
1013 → 1044	216 may be wrong (instr. problems)
1045 → 1173	210 → 216 were not measured
1047	125 bad coded
1056	51 (loop 1) bad coded
1094	137 bad coded
1100	114 bad coded
1130	43 bad point
1134	Instr. zero shift - group lost

NOTE: Bad coded-pressures not used in calculation of performance parameters

TABLE XXIII. CONFIGURATION RUN SUMMARY — SUPERSONIC UNIFORM FLOW FIELD[1] (VKF-A)

ITEM	CONFIG-URATION	M_∞	α/β deg./deg.	DEL2 deg.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
1	2DEC5	2.5	0/0	17.2	.320	2, 5, 15, 16, 18, 20, 21	4, 17, 19, 22	Effect of side bleed
2					.340	25, 31, 37, 43, 52, 87	26, 32, 38, 44, 53, 94	
3					.171	27, 33, 39, 58, 59, 86	28, 34, 40, 46, 57, 95	
4					.577	35, 41, 49, 50, 60, 88, 92	36, 42, 48, 51, 61, 93	
5			5/0		.577	62, 66, 77, 80, 81, 98	73, 82	
6					.340	63, 67, 68, 77, 83, 97	64, 69, 74, 78, 84	
7					.171	65, 70, 75, 76, 85, 96	71	
8			10/0		.577	89, 100, 107, 116, 117	108	
9					.340	90, 102, 104, 109, 114, 118	91, 105, 110, 115, 119	
10					.171	103, 111, 113, 120, 121	112	
11			15/0		.340	264, 266, 267, 277, 279	265, 268, 278	Re/ft = 7.3 X 10^6
12			20/0			269, 271, 272, 274, 275	270, 273, 276	Re/ft = 7.3 X 10^6
13			0/0			998, 1000, 1001, 1003, 1004, 1006	999, 1002, 1005	Repeat of Item 2
14			5/0			1013, 1014, 1015, 1016, 1017, 1018		Repeat of Item 6
15			10/0			1019, 1021, 1022, 1023, 1025	1020, 1024, 1026	Repeat of Item 9

1 - All data recorded at a nominal Reynolds number per ft. of 5.8 X 10^6 except where noted.

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	DEL2 deg.	TBX in.	GROUP NUMBERS		COMMENTS
						COMPRESSOR FACE	MOVABLE RAKE	
16	2DEC5	2.5	15/0	17.2	.340	1027, 1029, 1030, 1032	1028, 1031	
17			-5/0			1007, 1009, 1010, 1012	1008, 1011	
18			0/0	16.5		1033, 1035, 1036, 1037 1039	1034, 1038, 1040	
19			5/0			1047, 1048, 1049, 1050, 1051		
20			10/0			1052, 1054, 1055, 1056, 1058	1053, 1057, 1059	
21			15/0			1060, 1062, 1063, 1064, 1066	1061, 1065, 1067	
22			-5/0			1041, 1043, 1044, 1045	1042, 1046	
23			0/-4	17.2		1219, 1220, 1221, 1222, 1223		
24			10/-4			1224, 1225, 1226, 1227, 1228		
25			15/-4			1229, 1230, 1231, 1232, 1233		
26		2.0	0/0	11.4	.577	122, 128, 139, 141, 153	123, 129, 140, 142, 154	
27					.350	124, 130, 136, 143, 149, 132	125, 131, 137, 144, 151	
28					.150	126, 132, 138, 145, 147	127, 133, 135, 146, 148	
29			5/0		.577	155, 162, 163, 170, 171, 172		

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	DEL2 deg.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
30	2DEC5	2.0	5/0	11.4	.350	156, 160, 164, 168, 173, 187	157, 161, 165, 169, 174	
31			10/0		.577	176, 183, 184, 193, 196		
32					.350	177, 181, 185, 190, 194	178, 182, 186, 191, 195	
33					.150	179, 180, 186, 188, 189		
34			15/0		.350	257, 258, 259, 261, 262, 263	260	Re/ft = 7.3×10^6
35			20/0		.350	250, 251, 252, 254, 255, 256	253	Re/ft = 7.3×10^6
36			0/0		.350	197, 198, 199, 200, 201		Re/ft = 1.9×10^6
37			0/0	8.0	.406	243, 245, 247, 249	244, 246, 248	Re/ft = 7.3×10^6
38			0/0	11.4	.350	1068, 1070, 1071, 1072, 1074	1069, 1073, 1075	Repeat of Item 27
39			0/0	13.4		1076, 1078, 1079, 1080, 1082, 1083	1077, 1081, 1084	
40			5/0			1093, 1094, 1095, 1096, 1097		
41			10/0			1098, 1100, 1101, 1102, 1104, 1105	1099, 1103, 1106	
42			15/0			1107, 1109, 1110, 1111, 1113, 1114	1108, 1112, 1115	
43			-5/0			1085, 1087, 1088, 1089, 1091	1086, 1090, 1092	

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	DEL2 deg.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
44	2DEC5	2.0	0/0	8.0	.350	1117, 1119, 1120, 1122, 1123	1118, 1121, 1124	
45			5/0			1133, 1134, 1135, 1136, 1137		
46			10/0			1138, 1140, 1141, 1143, 1144	1139, 1142, 1145	
47			15/0			1146, 1148, 1149, 1151, 1152	1147, 1150, 1153	
48			-5/0			1125, 1127, 1128, 1130, 1131	1126, 1129, 1132	
49			0/-4	11.4		1204, 1205, 1206, 1207, 1208		
50			10/-4			1209, 1210, 1211, 1212, 1213		
51			15/-4			1214, 1215, 1216, 1217, 1218		
52		1.5	0/0	0	.181	202, 204, 206, 208, 210	203, 205, 207, 209, 211	
53			5/0			212, 214, 216, 218	213, 215, 217, 219	
54			10/0			220, 222, 224, 226	221, 223, 225, 227	
55			20/0			232, 233, 234, 236	235	
56			-5/0			228, 229, 230	231	
57			0/0	2.0		237, 238, 239, 241, 242	240	

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	DEL2 deg.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
58	2DEC5	1.5	0/0	0	.181	1154, 1156, 1157, 1159, 1160	1155, 1158, 1161	Repeat of Item 52
59			0/0	2.0		1162, 1164, 1165, 1167, 1168	1163, 1166	Repeat of Item 57
60			5/0			1174, 1175, 1176, 1177, 1178		
61			10/0			1179, 1180, 1181, 1182, 1183		
62			17.8/0			1184, 1185, 1186, 1187, 1188		
63			-5/0			1169, 1170, 1171, 1172, 1173		
64			0/-4	0		1189, 1190, 1191, 1192, 1193		
65			10/-4			1194, 1195, 1196, 1197, 1198		
66			17.8/-4			1199, 1200, 1201, 1202, 1203		
67	2DEC7	2.5	0/0	17.2	.340	280, 282, 285, 286	281, 284, 287	
68			5/0			288, 290, 291, 293, 294	289, 292, 295	
69			10/0			296, 298, 299, 301, 302	297, 300, 303	
70			20/0			304, 306, 307, 309, 310	305, 308, 311	
71		2.0	0/0	11.4	.350	312, 314, 315, 317	313, 316, 318	

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α / β deg./deg.	DEL2 deg.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
72	2DEC7	2.0	5/0	11.4	.350	319, 321, 322, 324, 325	320, 323, 326	
73	↓	↓	10/0	↓	↓	327, 329, 330, 332, 333	328, 331	
74	↓	↓	20/0	↓	↓	334, 335, 336, 338, 339	337	
75	↓	1.5	0/0	0	.181	340, 341, 343	342	
76	↓	↓	10/0	↓	↓	344, 345, 347, 348	346	
77	↓	↓	20/0	↓	↓	349, 350, 352, 353	351	
78	2DEC8	2.5	0/0	17.2	.340	1234, 1236, 1237, 1238, 1240	1235, 1239, 1241	
79	↓	↓	5/0	↓	↓	1242, 1243, 1244, 1245, 1246		
80	↓	↓	10/0	↓	↓	1247, 1248, 1249, 1250, 1251		
81	↓	↓	15/0	↓	↓	1252, 1254, 1255, 1256, 1258	1253, 1257, 1259	
82	↓	2.0	0/0	11.4	.350	354, 355, 356, 358, 359	357	
83	↓	↓	5/0	↓	↓	360, 361, 362, 364, 365	363	
84	↓	↓	10/0	↓	↓	366, 367, 368, 370, 371	369	
85	↓	↓	20/0	↓	↓	372, 373, 374, 376, 377	375	
86	↓	↓	0/0	13.4	.300	378, 379, 380		
87	↓	1.5	0/0	0	.181	1260, 1262, 1263, 1265, 1266	1261, 1264, 1267	

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_0	α/β deg./deg.	DEL2 deg.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
88	2D[illegible]8	1.5	5/0	0	.181	1268, 1269, 1270, 1271, 1272		
89			10/0			1273, 1274, 1275, 1276, 1277		
90			17.8/0			1278, 1279, 1280, 1281, 1282		
91			0/0			1283, 1284, 1285, 1286, 1287	1285	Zero ramp bleed

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α / β deg./deg.	CPX in.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
92	AXFC1	2.5	0/0	5.39	.270	381, 382, 384, 386	383, 385	
93	AXFC1				.490	387, 388, 390, 392	389, 391	
94	AXSC1				.270	393, 395, 396, 398	394, 397	
95	AXFC1	2.25		5.17	.260	554, 556, 557	555	
96				5.27	.260	558, 560, 561, 563, 564	559, 562, 565	
97					.400	569, 571, 572, 574, 575	570, 573, 576	
98			5/0			577, 579, 580	578, 581	
99			10/0			582	583	
100	AXSC1		0/0			584, 586, 587	585, 588	
101	AXSC1				.490	589, 591, 592	590, 593	
102	AXHC1				.400	594, 596, 597	595, 598	
103	AXFC1	2.0	0/0	4.90	.285	399, 401, 402, 404	400, 403	
104					.492	405, 407, 408, 410	406, 409, 411	
105					.145	412, 414, 415, 417	413, 416, 418	
106			5/0		.285	419, 421, 422, 424	420, 423, 425	
107			10/0			426, 427, 428	429	
108			15/0			430, 432	431	
109			0/0	5.00		433, 434, 435, 436		

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_0	α/β deg./deg.	CPX in.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
110	AXFC1	2.0	0/0	4.80	.285	437, 438, 439, 440		
111	AXFC1	2.0	0/0	4.90	.285	441, 443, 444, 446	442, 445, 447	$Re/ft = 1.6 \times 10^6$
112	AXSC1					452, 454, 455, 457, 459	453, 456, 458	
113	AXHC1					462, 464, 465, 467	463, 466, 468	
114	AXFC1	1.5	0/0	4.57	.320	479, 481, 482, 484, 485	480, 483, 486	
115			0/0		.145	487, 489, 490, 493, 496	488, 491, 494	
116			5/0		.320	495, 497, 504, 506, 507	496, 505, 508	
117			10/0			509, 511, 512, 514, 515	510, 513, 516	
118			15/0			517, 519, 520, 522, 523	518, 521, 524	
119			0/0	4.80		525, 526, 527, 528, 529		
120				5.10		530, 531, 532, 533, 534		
121	AXSC1			4.57		535, 537, 538, 540, 542	536, 539, 541, 543	
122	AXFC4	2.5	0/0	5.39	.490	716, 718, 719, 721	717, 720, 722	
123				5.49		709, 711, 712, 714	710, 713, 715	
124				5.29		723, 724, 725, 727	726	
125		2.25		5.27	.400	599, 601, 602, 604, 605	600, 603, 606	
126			5/0			607, 608, 610, 612, 613	608, 611, 614	
127			10/0			615, 617, 618, 620	616, 619, 621	

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α / β deg./deg.	CPX in.	TBX in.	GROUP NUMBERS		COMMENTS
						COMPRESSOR FACE	MOVABLE RAKE	
128	AXHC4	2.25	0/0	5.27	.400	622, 624, 625, 627	623, 626, 628	
129	AXSC4	2.25	↓	5.27	.400	633, 635, 636, 638, 639	634, 637, 640	
130	AXFC4	2.0	↓	4.90	.285	651, 653, 654, 656, 657	652, 655	
131	↓	↓	↓	5.00	↓	643, 645, 646, 648, 649	644, 647, 650	
132	↓	↓	5/0	↓	↓	658, 660, 662, 663	659, 661	
133	↓	↓	10/0	↓	↓	664, 666, 668, 669	665, 667, 670	
134	↓	↓	15/0	↓	↓	671, 672		
135	↓	1.5	0/0	4.57	.320	673, 675, 676, 678, 679	674, 677, 680	
136	↓	↓	5/0	↓	↓	681, 683, 684, 686, 687	682, 685, 688	
137	↓	↓	10/0	↓	↓	689, 691, 692, 694, 695	690, 693, 696	
138	↓	↓	15/0	↓	↓	697, 699, 700, 702, 703	698, 701, 704	
139	↓	↓	20/0	↓	↓	705, 706, 708	707	
140	AXFC3	2.5	0/0	5.39	.490	728, 730, 731, 733, 734	729, 732	
141	↓	2.25	0/0	5.27	.400	735, 737, 738, 740, 741	736, 739, 742	
142	↓	↓	5/0	↓	↓	743, 745, 746, 748, 749	744, 747, 750	
143	↓	↓	10/0	↓	↓	751, 753, 755	752, 754, 756	
144	↓	2.00	0/0	5.00	.285	765, 767, 768, 770, 771, 772	766, 769, 773	
145	↓	2.00	5/0	5.00	.285	774, 776, 777, 779	775, 778, 780	

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	CPX in.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
146	AXFC3	2.00	10/0	5.00	.285	781, 783, 784, 786, 787	782, 785, 788	
147			12/0			789, 790, 792, 794	791, 793	
148			-5/0			757, 759, 760, 762, 763	758, 761, 764	
149		1.5	0/0	4.57	.320	803, 805, 806, 808, 809	804, 807, 810	
150			5/0			811, 813, 814, 816, 817	812, 815, 818	
151			10/0			819, 821, 822, 825	820, 823, 826	
152			15/0			827, 829, 831	828, 830, 832	
153			20/0			833, 835, 837	834, 836, 838	
154			-5/0			795, 797, 798, 800, 801	796, 799, 802	
155	AXSC3		0/0			839, 841, 842, 844, 845	840, 843, 846	
156	AX7FC4	2.2	0/0	---	.400	855, 856, 857, 861		
157	AX7FC4		5/0			863, 865, 866		
158	AX7HC4		0/0			867, 868, 869		
159	AX7FC4	2.0			.430	870, 871, 872, 873, 874, 875		
160					.280	876, 878, 879, 880, 882	877, 881, 883	
161			10/0			884, 886, 887, 888	885, 889	
162	AX7HC4		0/0			890, 891, 892, 893, 894		
163	AX7HC4		10/0			895, 896, 897, 898		

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	CPX in.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	MOVABLE RAKE	COMMENTS
164	AX7FC4	1.5	0/0	--	.380	899, 901, 902, 903, 905, 906	900, 904, 907	
165	AX7FC4	↓	15/0	↓	↓	908, 910, 911, 913, 914	909, 912, 915	
166	AX7HC4	↓	0/0	↓	↓	916, 917, 918, 919, 920		

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α / β deg./deg.	DFL2 deg.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
167	2DM	3.0	0/0	12.0	.577	1289, 1291, 1292, 1294, 1295, 1297	1290, 1293, 1296	$Re/ft = 4.4 \times 10^6$
168					.249	1298, 1300, 1301, 1303, 1304	1299, 1302, 1305	
169					.410	1306, 1308, 1309, 1311, 1312	1307, 1310	
170			3/0			1321, 1323, 1324, 1326, 1327	1322, 1325, 1328	
171			6/0			1313, 1315, 1317, 1318, 1319	1314, 1316, 1320	
172			-3/0			1329, 1331, 1332, 1334	1330, 1333, 1335	
173			0/0	10.0		1336, 1337, 1338, 1339, 1340		
174		2.5		8.7	.577	939, 941, 942, 944, 945	940, 943, 946	
175					.220	947, 949, 950, 952, 953	948, 951, 954	
176					.410	1395, 1397, 1398, 1400	1396, 1399, 1401	
177			3.5/0			1410, 1411, 1412, 1413		
178			3.5/0			1414, 1416, 1417, 1419, 1420		Repeat of Item 177 with different acoustic honeycomb porosity
179			7/0	8.7		1402, 1404, 1406, 1407, 1408	1403, 1405, 1409	
180			-3/0			1422, 1424, 1425, 1427	1423, 1426, 1428	

TABLE XXIII. (Continued)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	DEL2 deg.	TBX in.	GROUP NUMBERS		COMMENTS
						COMPRESSOR FACE	MOVABLE RAKE	
181	2DM	2.5	0/0	10.7	.410	1429, 1430, 1431, 1432, 1433, 1434		
182		2.5		6.7	.410	1435, 1436, 1437, 1438		
183		2.25		2.4	.527	1341, 1343, 1345, 1346, 1347	1342, 1344, 1348	
184				3.4		1349, 1350, 1351, 1352, 1353		
185				4.4		1354, 1355, 1356, 1357		
186				4.4	.577	1358, 1359		
187				2.4	.175	1360, 1361, 1362, 1363, 1364		
188					.353	1365, 1367, 1368, 1370, 1372	1366, 1369, 1371	
189			5/0			1381, 1383, 1384, 1386	1382, 1385, 1387	
190			10/0			1373, 1375, 1376, 1378, 1380	1374, 1377, 1379	
191			-3/0			1388, 1390, 1391, 1393	1389, 1392, 1394	
192		1.5	0/0	0	.547	1439, 1440, 1441, 1442, 1443		
193			0/0		.368	1444, 1446, 1447, 1449, 1450	1445, 1448, 1451	
194			5/0		.368	1452, 1453, 1454, 1455, 1456		

TABLE XXIII. (Concluded)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	DEL2 deg.	TBX in.	GROUP NUMBERS		COMMENTS
						COMPRESSOR FACE	MOVABLE RAKE	
195	2DM	1.5	10/0	0	.368	1457, 1458, 1459, 1460, 1461		
196			15/0			1462, 1463, 1464, 1465, 1466		
197			-5/0			1467, 1468, 1469, 1470, 1471		

TABLE XXIV. CONFIGURATION RUN SUMMARY — TRANSONIC UNIFORM FLOW FIELD[1] (PWT-4T)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	DEL2 deg.	TBX[2] in.	PART NUMBERS COMPRESSOR FACE	PART NUMBERS MOVABLE RAKE	COMMENTS
1	2DEC5	1.2	0/0	0	.377	13, 15, 16, 18, 19	14, 17, 21	
2	↓	↓	10/0	↓	↓	170, 172, 173, 175, 176, 178	171, 174, 177	
3	↓	↓	20/0	↓	↓	179, 181, 182, 184, 185	180, 183, 186	
4	↓	↓	-5/0	↓	↓	161, 163, 164, 166, 167, 168	162, 165, 169	
5	↓	0.8	0/0	↓	↓	25, 28, 29, 31, 32	26, 30,33	
6	↓	↓	10/0	↓	↓	116, 118, 119, 121, 125, 126	117, 120, 127	
7	↓	↓	20/0	↓	↓	128, 132, 133, 135, 136	131, 134, 137	
8	↓	↓	28/0	↓	↓	138, 140, 141, 143, 144	139, 142, 145	
9	↓	↓	-5/0	↓	↓	106, 109, 110, 113, 114	108, 112, 115	
10	↓	↓	0/0	-4	↓	146, 147, 148, 149, 150		
11	↓	↓	10/0	↓	↓	151, 152, 153, 154, 155		
12	↓	↓	20/0	↓	↓	156, 157, 158, 159, 160		

1. All runs conducted at a nominal Reynolds number per ft of 5.5×10^6 unless otherwise noted.

2. For the PWT-4T test series, increasing TBX corresponds to decreasing throat bleed whereas in Tables XXIII and XXV (VKF tests), increasing TBX corresponds to increasing throat bleed.

3. A dashed number following a part number implies the test point number; eg, 293-1 refers to part number 293, test point 1. Part numbers without a dashed number automatically refer to test point 1.

TABLE XXIV. (Continued)

ITEM	CONFIG-URATION	M_o	α / β deg./deg.	DEL2 deg.	TBX in.	PART NUMBERS COMPRESSOR FACE	MOVABLE RAKE	COMMENTS
13	2DEC5	0.6	0/0	0	.377	35, 36, 38, 39, 42, 43	37, 41, 44	
14			10/0			53, 55, 56, 58, 59	54, 57, 60	
15			20/0			61, 63, 64, 66, 67	62, 65, 68	
16			28/0			69, 71, 72, 74, 75	70, 73, 76	
17			-5/0			45, 47, 48, 50	46, 49, 52	
18			0/0	-4	.414	77, 79, 80, 82, 83	78, 81, 84	
19			10/0			85, 87, 88, 90, 91	86, 89, 94	$Re/ft = 4.9 \times 10^6$
20			20/0			95, 97, 98, 100, 101	96, 99, 102	$Re/ft = 4.9 \times 10^6$
21	2DEC7	1.2	0/0	0	.377	268, 270, 271, 273, 274, 276	269, 272, 275	$Re/ft = 4.5 \times 10^6$
22			10/0			277, 280, 281, 284, 285	279, 282, 286	
23			20/0			287, 289, 291, 293-1, 293-2	288, 292, 294	
24			25/0			295, 296, 297, 298, 299		
25			0/0			300, 302, 303, 305, 306	301, 304	$Re/ft = 2.5 \times 10^6$
26		0.8	0/0	0	.377	229, 231, 232, 234, 235	230, 233, 236	$Re/ft = 4.5 \times 10^6$
27			10/0			237, 239, 241, 243, 244	238, 242, 245	
28			20/0			246, 248, 249, 251, 252	247, 250, 253	
29			28/0			254-1, 254-2, 255, 256, 257		

TABLE XXIV. (Continued)

ITEM	CONFIG-URATION	M_o	α / β deg./deg.	DEL2 deg.	TBX in.	PART NUMBERS COMPRESSOR FACE	PART NUMBERS MOVABLE RAKE	COMMENTS
30	2DEC7	0.8	0/0	0	.377	258, 261, 262, 264, 265	260, 263, 266	Re/ft = 2.5 X 10^6
31	2DEC8	1.2	0/0			356, 358, 359, 361, 362, 364	357, 360, 363	
32			10/0			365, 366, 367, 368, 369		
33			20/0			370, 372-1, 372-2, 374, 375	371, 373	
34			25/0			376, 377, 378, 379, 380		
35			0/0	14		381, 383, 384, 386, 390	382, 385	
36			0/0	14	.250	387, 388, 389		
37			0/0	7	.250	391, 392, 393, 394, 395		
38		1.2	0/-4	0	.377	332, 335, 336, 338, 339	334, 337, 340	
39			10/-4			341, 342, 343, 344, 345		
40			20/-4			346, 349, 350, 352, 353	348, 351	
41		0.8	0/0			396, 399, 400, 402-1, 402-2	397, 401	
42			10/0			403, 404, 405, 406, 407		
43			20/0			408, 410, 411, 414, 415	409, 412	
44			28/0			416, 417, 418, 419, 420		
45			0/-4			309, 311, 312, 314, 315	310, 313, 316	Re/ft = 4.5 X 10^6
46			10/-4			317, 319, 320-2, 322, 323	318, 321	

TABLE XXIV. (Continued)

ITEM	CONFIG-URATION	M_o	α / β deg./deg.	DEL2 deg.	TBX in.	PART NUMBERS COMPRESSOR FACE	PART NUMBERS MOVABLE RAKE	COMMENTS
47	2DEC8	0.8	20/-4	0	.377	324, 326, 328, 330, 331	325, 329	
48	2DEC10		0/0			449, 451, 452, 454, 455	450, 453	
49			10/0			456, 457, 458, 459, 460		
50			20/0			461, 463, 464, 466, 467	462, 465	
51			28/0			468, 469, 470, 471, 472		
52			0/0		0	473, 474, 475, 476, 477	478, 479	Bleed effect
53		0.6	0/0		.377	423, 425, 426, 428, 429	424, 427	
54			10/0			430, 431, 432, 433, 434		
55			20/0			435, 437, 438, 440, 441	436, 439	
56			28/0			442, 444, 445, 446, 447		

TABLE XXIV. (Continued)

ITEM	CONFIG-URATION	M_o	α / β deg./deg.	CPX in.	TBX in.	PART NUMBERS COMPRESSOR FACE	MOVABLE RAKE	COMMENTS
57	AXFC3	1.2	0/0	4.37	.320	570, 572, 573, 575, 576	571, 574, 577	
58			10/0			578, 580, 581, 583, 584	579, 582, 585	
59			15/0			586, 588, 589, 591, 592	587, 590, 593	
60			20/0			594, 595, 596, 597, 598		
61		0.8	0/0			541, 542, 544, 545, 547, 548	542, 546, 649	
62			10/0			550, 552, 553, 555, 556	551, 554	
63			15/0			557, 559, 560, 562, 563	558, 561, 564	
64			20/0			565, 566, 567, 568, 569		
65			0/0	4.57		483, 485, 486, 488, 489	484, 487, 490	Re/ft = 5×10^6
66			10/0			501, 503, 504, 506, 507	502, 505, 508	
67			20/0			509, 511, 512, 514, 515	510, 513, 516	
68			-5/0			493, 495, 496, 498, 499	494, 497, 500	
69		0.6	0/0	4.37		519, 521, 522, 524, 525	520, 523, 526	
70			15/0			534, 536, 537, 539, 540		
71			28/0			527, 530, 531, 532, 533		
72	AXFC1	1.2	0/0			630, 632, 633, 636, 637, 660, 662	631, 634, 638, 661, 663	
73			10/0			639, 641, 642, 644, 645	640, 643, 646	

TABLE XXIV. (Continued)

ITEM	CONFIG-URATION	M_o	α / β deg./deg.	CPX in.	TBX in.	PART NUMBERS COMPRESSOR FACE	MOVABLE RAKE	COMMENTS
74	AXFC1	1.2	15/0	4.37	.320	647, 649, 650, 652, 653	648, 651, 654	
75		1.2	20/0			655, 656, 657, 658, 659		
76		0.8	0/0			601, 603, 604, 607, 664	602, 605, 608, 665	
77			10/0			609, 611, 612, 614, 615	610, 613, 616	
78			15/0			617, 619, 620, 622, 623	618, 621, 624	
79			20/0			625, 626, 627, 628, 629		
80	AXFC4	1.2	0/0			697, 699, 700, 702, 703	698, 701, 704	
81			10/0			705, 707, 708, 710, 711	706, 709, 712	
82			15/0			713, 715, 716, 718, 719	714, 717, 720	
83			20/0			721, 722, 723, 724, 725		
84			0/0			1010, 1013, 1014, 1016, 1017	1012, 1015, 1018	Repeat of Item 80
85			10/0			1019, 1021, 1022, 1024, 1025	1020, 1023, 1026	Repeat of Item 81
86			15/0			1028, 1030, 1031, 1033, 1034	1029, 1032, 1035	Repeat of Item 82
87			20/0			1036, 1038, 1039, 1040, 1041		Repeat of Item 83
88			0/0		.577	1063, 1065, 1066, 1067, 1068	1064	Bleed effect
89			0/0		0	1071, 1072, 1073,1074-1		Bleed effect

TABLE XXIV. (Continued)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	CPX in.	TBX in.	PART NUMBERS COMPRESSOR FACE	MOVABLE RAKE	COMMENTS
90	AXFC4	1.2	0/-4	4.37	.320	747, 748, 749, 750, 751		
91	↓	1.2	10/-4	↓	↓	752, 753, 754, 755, 756		
92		0.8	0/0			668, 670, 671, 673, 674	669, 672, 675	
93		↓	10/0			676, 678, 679, 681, 682	677, 680, 683	
94			15/0			684, 686, 687, 689, 690	685, 688, 691	
95			20/0			692, 693, 694, 695, 696		
96			0/0			979, 981, 982, 984, 985	980, 983, 986	Repeat of Item 92
97			10/0			987, 989, 990, 992, 993	988, 991, 994	Repeat of Item 93
98			15/0			996, 998, 999, 1001,1002	997, 1000, 1003	Repeat of Item 94
99			20/0			1004, 1005, 1006, 1007, 1008		Repeat of Item 95
100			0/0		.577	1053, 1054, 1057, 1058, 1060, 1061	1056, 1059, 1062	Bleed effect
101			0/0		0	1074-2, 1075, 1076, 1077, 1078		Bleed effect
102			0/-4		.320	728, 730, 731, 733, 734	729, 732	
103			10/-4		↓	735, 737, 738, 740, 741	736, 739	
104			15/-4			742, 743, 744, 745, 746		
105		0.6	0/0			1043, 1045, 1046, 1048, 1049	1044, 1047, 1050	Re/ft = 5×10^6

TABLE XXIV. (Continued)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	CPX in.	TBX in.	PART NUMBERS COMPRESSOR FACE	MOVABLE RAKE	COMMENTS
106	AX7FC4	1.2	0/0	4.37	.380	833, 835, 836, 838, 839	834, 837, 840	
107			5/0			841-2, 843, 844, 845, 846	842	
108			10/0			847, 849, 850, 852, 853	848, 851, 854	
109			15/0			855, 857, 858, 860, 861	856, 859, 863	
110			20/0			864, 865, 866, 867, 868		
111	AX7SC4		0/0			896, 898, 899-2, 901, 902-2	897, 900, 903	
112			10/0			904, 906, 907, 909, 910	905, 908, 912	
113			15/0			913, 915, 916, 918, 919	914, 917, 920	
114	AX7HC4		0/0			948, 950, 951, 953, 954, 957	949, 952, 956, 958	
115			10/0			959, 961, 962, 964, 965	960, 963, 966	
116			15/0			967, 970, 971, 973, 974	969, 972, 975	
117	AX7FC4	0.8	0/0			796, 798, 799, 801, 802	797, 800, 803	
118			5/0			804, 805, 806, 807, 808		
119			10/0			809, 811, 812, 814, 815	810, 813, 816	
120			15/0			818, 820, 821, 823, 824	819, 822, 825	
121			20/0			826, 827, 828, 829, 830		
122	AX7SC4		0/0			871, 873, 874, 877, 878	872, 876, 879	

TABLE XXIV. (Concluded)

ITEM	CONFIG-URATION	M_o	α/β deg./deg.	CPX in.	TBX in.	PART NUMBERS		COMMENTS
						COMPRESSOR FACE	MOVABLE RAKE	
123	AX7SC4	0.8	10/0	4.37	.380	880, 882, 883, 885, 886	881, 884, 887	
124	AX7SC4		15/0			888, 890-2, 891, 893, 894-2	889, 892, 895	
125	AX7HC4		0/0			923, 925, 926, 928, 929	924, 927, 930	
126			10/0			931, 933, 934, 936, 937	932, 935, 938	
127			15/0			939, 941, 942, 944, 945	940, 943, 947	
128	AX7FC4	0.6	0/0			760, 762, 763, 765, 766	761, 764, 767	
129			5/0			768, 769, 770, 771, 772		
130			10/0			773, 775, 776, 778, 779	774, 777, 780	
131			15/0			782, 784, 785, 787, 788	783, 786, 789	
132			20/0			790, 791, 792, 793, 794		

TABLE XXV. CONFIGURATION RUN SUMMARY – SUPERSONIC NONUNIFORM FLOW FIELD (VKF-A)

ITEM	CONFIG-URATION	M_O	$\Delta M/M_O$	α/β Deg./Deg.	DEL2 deg.	TBX in.	GROUP NUMBERS		COMMENTS
							COMPRESSOR FACE	MOVABLE RAKE	
1	2DE	2.5	-	0/0	17.2	.340	1, 3, 5, 7, 9, 12, 13, 14	2, 4, 6, 8, 10	
2			.10				258, 260, 262, 264, 266	259, 261, 263, 265, 267	
3			.15				268, 270, 272, 274, 276	269, 271, 273, 275, 277	
4			.20				278, 280, 282, 284, 286	279, 281, 283, 285, 287	
5				5/0			325, 327, 329, 331, 332	326, 328, 330	
6				10/0			288, 290, 292, 294, 295	289, 291, 293	
7				15/0			306, 308, 310, 312, 313	307, 309, 311	
8				5/0	16.5		333, 335, 337, 339, 340	334, 336, 338	
9				10/0	11.0		296, 298, 300, 302, 304, 316, 318	297, 299, 301, 303, 305, 317, 319	
10				15/0	6.0		314, 315, 320, 322, 324	321, 323	
11		2.25	–	0/0	14.6	.350	15, 17, 19, 20, 22, 24, 26, 27, 28	16, 18, 21, 23, 25	
12				5/0			29, 31, 33, 35, 37, 39	30, 32, 34, 36, 38	
13				10/0			40, 41, 42, 43, 44		
14				15/0			45, 47, 48, 50, 51, 52, 53	46, 49	

TABLE XXV. (Continued)

ITEM	CONFIG-URATION	M_o	$\Delta M/M_o$	α/β Deg./Deg.	DEL2 deg.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
15	2DE	2.25	-	0/0	16.6	.350	54, 55, 57, 58, 59	56	
16			-		12.6		60, 61, 63, 64, 65	62	
17			.15		14.6		341, 343, 345, 347, 348	342, 344, 346, 349	
18			.20				353, 355, 357, 359, 360, 362	354, 356, 358, 361	
19				5/0			363, 365, 367, 369, 370, 371	364, 366, 368, 372	
20				10/0			373, 375, 377, 379, 380, 381	374, 376, 378	
21				15/0			382, 383, 385, 387, 389, 390	384, 386, 388, 391	
22		2.0	-	0/0	11.4		118, 119, 121, 123, 125, 126, 128	120, 122, 124, 127	
23				5/0			129, 130, 132, 133, 134	131	
24				10/0			135, 137, 139, 141, 143	136, 138, 140, 142, 144	
25	2DEV			0/0			72, 74, 76, 78, 80, 82, 83	73, 75, 77, 79, 31	Full vortex generator configuration.
26				2/0			84, 86, 88, 90, 91	85, 87, 89	
27				5/0			92, 93, 95, 97, 98	94, 96	
28			-	0/0			99, 100, 102, 104, 106 107, 109	101, 103, 105, 108	Repeat of Item 25

TABLE XXV. (Continued)

ITEM	CONFIG-URATION	M_o	$\Delta M/M_o$	α/β Deg./Deg.	DEL2 deg.	TBX in.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
29	2DEV	2.0	-	0/0	11.4	.350	110, 112, 114, 116, 117	111, 113, 115	Partial vortex generator configuration.
30	2DE		.15	0/0			184, 185, 187, 189, 191, 193	186, 188, 190, 192	
31				5/0			250, 251, 252, 253, 254		
32				10/0			242, 244, 246, 248, 249	243, 245, 247	
33				0/0			437, 438, 439, 441, 442, 443	440	Repeat of Item 30
34			<.15				430, 431, 432, 434, 435, 436	433	
35			.20				194, 196, 198, 200, 202	195, 197, 199, 201, 203	
36				5/0			217, 218, 220, 222, 223	219, 221	
37				10/0			224, 226, 228, 230, 232	225, 227, 229, 231	
38				15/0			233, 235, 237, 239, 241	234, 236, 238, 240	
39				0/0	8.0		204, 205, 207, 209	206, 208	
40					13.4		210, 211, 213, 215, 216	212, 214	
41		1.75	-		7.2	.270	156, 158, 160, 162,	157, 159, 161, 163	
42		1.75	-	15/0	7.2	.270	165, 166, 167, 168		

TABLE XXV. (Continued)

ITEM	CONFIG-URATION	M_o	$\Delta M/M_o$	α/β Deg./Deg.	DEL2 deg.	TRX in.	GROUP NUMBERS		COMMENTS
							COMPRESSOR FACE	MOVABLE RAKE	
43	2DE	1.75	.15	0/0	7.2	.270	396, 398, 400, 402, 404	397, 399, 401, 403, 405	
44			.20	0/0			406, 408, 410, 412, 414	407, 409, 411, 413, 415	
45				5/0			416, 417, 418, 419, 420		
46				15/0			421, 423, 425, 427, 428	422, 424, 426, 429	
47		1.5	-	0/0	0	.180	145, 146, 147, 148		
48		1.5	-	15/0	0	.180	149, 151, 153, 154	150, 152, 155	
49	2DEI	2.5	.10	0/0	17.2	.340	444, 446, 448, 450	445, 447, 449, 451	
50			.15				452, 454, 456, 457, 458	453, 455	
51			.20				459, 461, 463, 465, 467	460, 462, 464, 466, 468	
52			.20		16.5		469, 470, 472, 474, 476, 478	473, 475, 477	
53			.15		17.2		519, 520, 522, 524, 525	521, 523, 526	
54				5/0			527, 529, 531, 533, 534	528, 530, 532, 535	
55				10/0			536, 538, 540, 541, 542	537, 539, 543	
56				15/0			544, 546, 548, 550, 551	545, 547, 549, 552	

TABLE XXV. (Continued)

ITEM	CONFIG-URATION	M_o	$\Delta M/M_o$	α/β Deg./Deg.	DEL2 Deg.	TBX In.	GROUP NUMBERS		COMMENTS
							COMPRESSOR FACE	MOVABLE RAKE	
57	2DEI	2.5	.15	-5/0	17.2	.340	553, 555, 557, 559 560	556, 558	
58		2.25	.15	0/0	14.6	.350	479, 481, 483, 485, 487	480, 482, 484, 486, 488	
59			.20		14.6		489, 491, 493, 495, 497	490, 492, 494, 496, 498	
60					12.6		499, 501, 503, 504, 506 508	500, 502, 505, 507, 509	
61					16.6		510, 512, 514, 516, 517	511, 513, 515, 518	
62		2.0	.15		11.4		561, 563, 565, 567, 569	562, 564, 566, 568, 570	
63			.20		11.4		571, 573, 575, 576, 578 580	572, 574, 577, 579, 581	
64					8.0		582, 583, 585, 587, 589 590	584, 586, 588, 591	
65					13.4		628, 629, 630, 631, 632		
66			.15	5/0	11.4		592, 594, 596, 598, 599	593, 595, 597, 600	
67				10/0			601, 603, 605, 607, 608	602, 604, 606, 609	
68				15/0			619, 621, 623, 625, 626	620, 622, 624, 627	
69				-4/0			610, 612, 614, 616, 617	611, 613, 615, 618	
70		1.75		0/0	7.2	.270	633, 635, 637, 639, 640	634, 636, 638, 641	
71		1.75	.20	0/0	7.2	.270	642, 644, 646, 648, 649 651	643, 645, 647, 650	

TABLE XXV. (Continued)

ITEM	CONFIG-URATION	M_o	$\Delta M/M_o$	α/β Deg./Deg.	DEL2 Deg.	TBX In.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
72	2DEN[1]	2.5	.10	0/0	17.2	.340	652, 654, 656, 658, 659	653, 655, 657, 660	
73		2.5	.15		17.2	.340	661, 663, 665, 667	662, 664, 666, 668	
74		2.25			14.6	.350	669, 670, 671, 672		
75		2.0			11.4		673, 674, 675, 676		
76			.10				677, 679, 681, 682, 683	678, 680, 684	
77				5/0			685, 686, 687, 688, 689		
78		1.75		0/0	7.2	.270	690, 691, 692, 693, 694		
79		1.75	.15	0/0	7.2	.270	695, 696, 697, 698, 699, 701	700	

1- For all 2DEN configurations (model rolled +90° from upright), α and β are relative to the tunnel support system. For all other configurations, α and β are identified with the upright model attitude convention.

TABLE XXV. (Continued)

ITEM	CONFIG-URATION	M_0	$\Delta M/M_0$	α/β Deg./Deg.	CPX In.	TBX In.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
80	AXFC2	2.5	-	0/0	5.39	.490	1013, 1015, 1017, 1019	1014, 1016, 1018, 1020	
81			-	5/0	5.24		1021, 1023, 1025, 1027	1022, 1024, 1026, 1028	
82			.10	0/0	5.39		713, 715, 717, 719	714, 716, 718, 720	
83			.15				721, 723, 725, 727	722, 724, 726, 728	
84			.20				729, 731, 733, 735	730, 732, 734, 736	
85				5/0			737, 739, 741, 743	738, 740, 742, 744	
86				-5/0			745, 747, 749, 751	746, 748, 750, 752	
87				0/0	5.24		753, 755, 756, 757, 758, 759, 761, 763	754, 760, 762	
88				0/0	5.54		764, 766, 768, 769	765, 767	
89	AXSC2		-	0/-4	5.39		1119, 1121, 1123, 1125, 1127, 1129	1120, 1122, 1124, 1126, 1128	
90	AXFC2	2.25		0/0	5.27	.400	1029, 1031, 1033, 1035	1030, 1032, 1034, 1036, 1038	
91				10/0	5.12		1039, 1041, 1043	1040, 1042, 1044	
92			.20	0/0	5.27		776, 777, 780, 782, 784	778, 779, 781, 783, 785	
93				5/0			786, 788, 790, 792	787, 789, 791, 793	
94				10/0			794, 796, 798, 800	795, 797, 799, 801	
95				15/0			802, 803, 805, 807	804, 806, 808	
96				0/0	5.12		809, 811, 813, 815, 817	810, 812, 814, 816, 818	

TABLE XXV. (Continued)

ITEM	CONFIG-URATION	M_o	$\Delta M/M_o$	α/β Deg./Deg.	CPX In.	TBX In.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
97	AXFC2	2.25	.20	0/0	4.97	.400	819, 821, 823, 825, 827	820, 822, 824, 826, 828	
98	AXSC2	↓	-	0/-4	5.27	↓	1130, 1132, 1134, 1136 1138, 1140	1131, 1133, 1135, 1137 1139	
99	AXSC2	↓	↓	10/-4	5.12	↓	1141, 1143, 1145, 1147 1148	1142, 1144, 1146	
100	AXFC2	2.0	↓	0/0	5.00	.360	1083, 1085, 1087, 1089 1090	1084, 1086, 1088, 1091	
101	↓	↓	↓	10/0	4.85	↓	1092, 1094, 1096, 1098	1093, 1095, 1097, 1099	
102	↓	↓	.15	0/0	5.00	↓	868, 870, 872, 874, 875, 877	869, 871, 873, 876	
103	AXFC2	2.0	.20	↓	5.20	↓	836, 838, 840	837, 839	
104	↓	↓	↓	↓	5.00	↓	841, 843, 845, 847, 849	842, 844, 846, 848, 850	
105	↓	↓	↓	↓	4.85	↓	851, 853, 855, 857, 859	852, 854, 856, 858, 860	
106	↓	↓	↓	↓	4.75	↓	861, 863, 865, 867	862, 864, 866	
107	↓	↓	↓	5/0	4.85	↓	878, 880, 882, 884, 885	879, 881, 883, 886	
108	↓	↓	↓	10/0	↓	↓	887, 889, 891	888, 890, 892	
109	↓	↓	↓	15/0	↓	↓	893, 895, 897, 899, 900	894, 896, 898, 901	
110	AXSC2	↓	-	0/-4	5.00	↓	1149, 1151, 1153, 1155, 1157	1150, 1152, 1154, 1156, 1158	
111	↓	↓	↓	5/-4	4.85	↓	1163, 1165, 1166, 1168, 1170	1164, 1167, 1169, 1171	
112	↓	↓	↓	10/-4	4.85	↓	1159, 1160, 1161, 1162	1172, 1173	

TABLE XXV. (Continued)

ITEM	CONFIG-URATION	M_o	$\Delta M/M_o$	α/β Deg./Deg.	CPX In.	TBX In.	GROUP NUMBERS COMPRESSOR FACE	GROUP NUMBERS MOVABLE RAKE	COMMENTS
113	AXSC2	2.0	.20	0/-4	5.00	.360	997, 999, 1000, 1001, 1002	998	
114	↓	↓	↓	5/-4	4.85	↓	1008, 1009, 1010, 1011 1012		
115	↓	↓	↓	10/-4	4.85	↓	1003, 1004, 1005, 1006 1007		
116	AXFC2	1.75	-	0/0	4.80	.320	1045, 1047, 1049, 1051, 1053	1046, 1048, 1050, 1052	
117	↓	↓	↓	5/0	↓	↓	1055, 1057, 1059, 1061, 1063	1056, 1058, 1060, 1062, 1064	
118	↓	↓	↓	10/0	↓	↓	1065, 1067, 1069, 1071 1073	1066, 1068, 1070, 1072	
119	↓	↓	↓	15/0	↓	↓	1075, 1077, 1079, 1081, 1082	1076, 1078, 1080	
120	↓	↓	.15	0/0	↓	↓	976, 978, 980, 982, 983	977, 979, 081	
121	↓	↓	>.15	↓	↓	↓	930, 932, 934, 936, 937	931, 933, 938	
122	↓	↓	.20	↓	5.00	↓	909, 911, 912, 914	910, 913	
123	↓	↓	↓	↓	4.80	↓	915, 917, 919, 921, 922	916, 918, 920, 923	
124	↓	↓	↓	↓	4.57	↓	924, 926, 927, 929	925, 928	
125	↓	↓	↓	5/0	4.80	↓	939, 941, 943, 945, 946	940, 942, 944, 947	
126	↓	↓	↓	10/0	↓	↓	948, 950, 952, 954, 955	949, 951, 953, 956	
127	↓	↓	↓	15/0	↓	↓	957, 959, 960, 961, 963 965	958, 962, 964, 966	

TABLE XXV. (Concluded)

ITEM	CONFIG-URATION	M_o	$\Delta M/M_c$	α/β Deg./Deg.	CPX In.	TBX In.	GROUP NUMBERS		COMMENTS
							COMPRESSOR FACE	MOVABLE RAKE	
128	AXFC2	1.75	.20	-5/0	4.80	.320	967, 969, 971, 973, 974	968, 970, 972, 975	
129	AXSC2	↓	↓	0/-4	↓	↓	984, 986, 987, 989, 990	985, 988	
130	AXSC2	↓	↓	10/-4	↓	↓	991, 992, 993, 995, 996	994	
131	AXFC2	1.50	-	0/0	↓	↓	1100, 1102, 1104, 1106, 1107	1101, 1103, 1105, 1108	
132	AXSC2	1.50	-	0/-4	↓	↓	1109, 1111, 1113, 1115, 1117	1110, 1112, 1114, 1116, 1118	

DATE 5-27-70

AEDC(ARO),INC.)ARNOLD AFS, TENNESSEE
VON KARMAN GAS DYNAMICS FACILITY
GAS DYNAMIC WIND TUNNEL, SUPERSONIC (A)

PAGE NUMBER ONE

GROUP	CONFIG	PROJECT	ALPHA-M	ALPHA-M1	ALPHA-M2	BETA-M1	BETA-M2	DEL 2	MBX	TBX
1001	1	VA0926	.010	.180	.180	0	0	17.200	.791	.340

AC	IINF	P-INF	Q-INF	V-INF	RHO-INF	MU-INF	RE/FI	MACH NO	TO
15.02	2.502E 02	1.764E 00	7.716E 00	1.939E 03	5.913E-04	2.002E-07	5.725E 00	2.50	5.630E 02

CFR	DICF	WCF(CORR)	(RMSCF)AVG	PREF
8.043E-01	5.473E-02	1.941E 00	1.175E-02	3.937E 00

WCF	WBI	WBR	WBS1	WO	WC	WCF/WC	WBI/WC	WBR/WC	WBS1/WC	WO/WC
3.073E 00	2.310E-01	7.138E-02	0	3.376E 00	3.848E 00	7.985E-01	6.018E-02	1.855E-02	0	8.772E-01

RMS1	RMS2	RMS3	RMS4	RMS5	RMS6	RMS7	RMS8	RMS9	RMS10	RMS11	RMS14
3.051E-01	2.367E-01	2.798E-01	2.988E-01	5.203E-01	3.216E-01	2.874E-01	1.054E-01	1.187E-01	1.956E-02	1.014E-01	3.051E-02

RMS1/PICF	RMS2/PICF	RMS3/PICF	RMS4/PICF	RMS5/PICF	RMS6/PICF	RMS7/PICF	RMS8/PICF	RMS9/PICF	RMS10/PICF	RMS11/PICF	RMS14/PICF
1.259E-02	9.764E-03	1.154E-02	1.233E-02	2.147E-02	1.327E-02	1.186E-02	4.349E-03	4.897E-03	8.071E-04	7.483E-03	1.259E-03

VALUE	PORT	TAP	X/L	P	P/PINF	P/PO	CP	PO	PINF	QINF
1	33	1	-3.175E-01	3.319E 00	1.887E 00	1.105E-01	2.028E-01	3.005E 01	1.759E 00	7.694E 00
1	7	2	-2.096E-01	3.309E 00	1.885E 00	1.103E-01	2.024E-01	2.998E 01	1.755E 00	7.678E 00
1	8	3	-1.179E-01	8.354E 00	4.742E 00	2.775E-01	8.552E-01	3.010E 01	1.762E 00	7.708E 00
2	8	4	-9.107E-02	8.328E 00	4.727E 00	2.767E-01	8.519E-01	3.010E 01	1.762E 00	7.708E 00
1	9	5	-6.607E-02	7.935E 00	4.516E 00	2.643E-01	8.036E-01	3.002E 01	1.757E 00	7.688E 00
2	9	6	-5.000E-02	7.077E 00	4.027E 00	2.357E-01	6.920E-01	3.002E 01	1.757E 00	7.688E 00
1	10	7	-2.429E-02	8.419E 00	4.777E 00	2.796E-01	8.634E-01	3.011E 01	1.762E 00	7.710E 00
2	10	8	-1.214E-02	1.116E 01	6.331E 00	3.705E-01	1.219E 00	3.011E 01	1.762E 00	7.710E 00
1	11	9	1.786E-03	9.982E 00	5.685E 00	3.327E-01	1.071E 00	3.000E 01	1.756E 00	7.682E 00
2	7	20	-3.357E-02	1.850E 01	1.054E 01	6.170E-01	2.181E 00	2.998E 01	1.755E 00	7.678E 00
2	33	21	-1.786E-02	1.834E 01	1.043E 01	6.105E-01	2.156E 00	3.005E 01	1.759E 00	7.694E 00
2	32	22	0	1.922E 01	1.095E 01	6.408E-01	2.274E 00	3.000E 01	1.756E 00	7.682E 00
2	31	23	1.679E-02	2.008E 01	1.140E 01	6.673E-01	2.377E 00	3.009E 01	1.761E 00	7.704E 00
2	30	24	3.393E-02	2.050E 01	1.168E 01	6.836E-01	2.441E 00	2.999E 01	1.755E 00	7.680E 00
2	29	25	5.179E-02	2.082E 01	1.180E 01	6.904E-01	2.468E 00	3.015E 01	1.765E 00	7.720E 00
2	28	26	6.750E-02	2.113E 01	1.203E 01	7.042E-01	2.522E 00	3.001E 01	1.756E 00	7.684E 00
2	27	27	1.607E-01	2.136E 01	1.212E 01	7.095E-01	2.542E 00	3.011E 01	1.762E 00	7.710E 00
2	26	28	2.679E-01	2.175E 01	1.236E 01	7.233E-01	2.596E 00	3.007E 01	1.760E 00	7.700E 00
2	25	29	4.464E-01	2.246E 01	1.273E 01	7.452E-01	2.682E 00	3.013E 01	1.764E 00	7.716E 00
1	32	40	4.107E-02	2.210E 01	1.259E 01	7.367E-01	2.649E 00	3.000E 01	1.756E 00	7.682E 00
1	31	41	5.893E-02	2.028E 01	1.152E 01	6.741E-01	2.404E 00	3.009E 01	1.761E 00	7.704E 00
1	30	42	7.679E-02	2.018E 01	1.149E 01	6.728E-01	2.399E 00	2.999E 01	1.755E 00	7.680E 00
1	29	43	9.500E-02	2.039E 01	1.155E 01	6.762E-01	2.412E 00	3.015E 01	1.765E 00	7.720E 00
1	28	44	1.679E-01	2.088E 01	1.189E 01	6.959E-01	2.489E 00	3.001E 01	1.756E 00	7.684E 00
1	27	45	2.718E-01	2.165E 01	1.229E 01	7.191E-01	2.580E 00	3.011E 01	1.762E 00	7.710E 00

a. Primary Performance Data, Sheet 1

Figure 19. Sample Tabulated Data Format - Uniform Flow Field, VKF-A Tunnel, 2DE Inlet

PAGE NUMBER 2 GROUP 1301

DATE 5 27 70

VALUE	PORT	TAP	X/L	P	P/PINF	P/PO	CP	PO	PINF	QINF
1	26	45	4.500E-01	2.250E 01	1.279E 01	7.483E-01	2.694E 00	3.007E 01	1.760E 00	7.700E 00
1	25	47	4.321E-01	2.297E 01	1.302E 01	7.622E-01	2.748E 00	3.013E 01	1.764E 00	7.716E 00
1	1	48	4.286E-01	2.314E 01	1.312E 01	7.680E-01	2.771E 00	3.013E 01	1.764E 00	7.716E 00
2	11	60	-3.750E-02	4.115E 00	2.344E 00	1.372E-01	3.072E-01	3.000E 01	1.756E 00	7.682E 00
1	39	61	-3.071E-02	3.361E 00	1.926E 00	1.127E-01	2.118E-01	2.981E 01	1.745E 00	7.634E 00
2	39	62	-2.429E-02	3.925E 00	2.249E 00	1.317E-01	2.856E-01	2.981E 01	1.745E 00	7.634E 00
1	40	63	-1.668E-02	5.035E 00	2.867E 00	1.678E-01	4.268E-01	3.000E 01	1.756E 00	7.682E 00
2	40	64	4.643E-03	5.733E 00	3.265E 00	1.911E-01	5.177E-01	3.000E 01	1.756E 00	7.682E 00
1	41	65	2.393E-02	5.383E 00	3.080E 00	1.803E-01	4.755E-01	2.986E 01	1.748E 00	7.646E 00
2	41	66	7.250E-02	1.407E 00	8.053E-01	4.713E-02	-4.450E-02	2.986E 01	1.748E 00	7.646E 00
1	42	70	0	1.467E 01	8.345E 00	4.884E-01	1.679E 00	3.004E 01	1.758E 00	7.692E 00
1	43	71	0	1.743E 01	9.943E 00	5.820E-01	2.044E 00	2.995E 01	1.753E 00	7.668E 00
1	44	72	0	2.541E 01	1.445E 01	8.460E-01	3.075E 00	3.004E 01	1.758E 00	7.692E 00
1	45	73	0	2.702E 01	1.539E 01	9.008E-01	3.289E 00	3.000E 01	1.756E 00	7.682E 00
1	46	74	0	2.652E 01	1.514E 01	8.859E-01	3.231E 00	2.994E 01	1.752E 00	7.666E 00
1	47	75	0	2.510E 01	1.432E 01	8.381E-01	3.045E 00	2.995E 01	1.753E 00	7.668E 00
2	42	80	0	2.065E 01	1.175E 01	6.875E-01	2.456E 00	3.004E 01	1.758E 00	7.692E 00
2	43	81	0	2.281E 01	1.302E 01	7.619E-01	2.747E 00	2.995E 01	1.753E 00	7.668E 00
2	44	82	0	2.560E 01	1.456E 01	8.523E-01	3.100E 00	3.004E 01	1.758E 00	7.692E 00
2	45	83	0	2.640E 01	1.504E 01	8.802E-01	3.209E 00	3.000E 01	1.756E 00	7.682E 00
2	46	84	0	2.626E 01	1.499E 01	8.772E-01	3.197E 00	2.994E 01	1.752E 00	7.666E 00
2	47	85	0	2.511E 01	1.433E 01	8.385E-01	3.046E 00	2.995E 01	1.753E 00	7.668E 00
1	22	90	0	2.284E 01	1.298E 01	7.596E-01	2.738E 00	3.006E 01	1.759E 00	7.698E 00
2	22	91	0	2.300E 01	1.307E 01	7.651E-01	2.759E 00	3.006E 01	1.759E 00	7.698E 00
1	23	92	0	2.299E 01	1.305E 01	7.638E-01	2.755E 00	3.010E 01	1.762E 00	7.708E 00
2	23	93	0	2.310E 01	1.311E 01	7.675E-01	2.769E 00	3.010E 01	1.762E 00	7.708E 00
1	24	94	0	2.295E 01	1.305E 01	7.637E-01	2.754E 00	3.005E 01	1.759E 00	7.694E 00
2	24	95	0	2.324E 01	1.321E 01	7.734E-01	2.792E 00	3.005E 01	1.759E 00	7.694E 00
1	0	100	9.604E-01	2.274E 01	1.289E 01	7.546E-01	2.718E 00	3.013E 01	1.764E 00	7.716E 00
1	2	101	1.000E 00	2.353E 01	1.334E 01	7.811E-01	2.822E 00	3.013E 01	1.763E 00	7.714E 00
1	3	102	1.000E 00	2.364E 01	1.346E 01	7.880E-01	2.849E 00	3.000E 01	1.756E 00	7.682E 00
1	4	103	1.000E 00	2.368E 01	1.344E 01	7.867E-01	2.844E 00	3.010E 01	1.762E 00	7.708E 00
1	5	104	1.000E 00	2.376E 01	1.353E 01	7.918E-01	2.864E 00	3.001E 01	1.756E 00	7.684E 00
1	6	105	1.000E 00	2.374E 01	1.347E 01	7.881E-01	2.849E 00	3.013E 01	1.763E 00	7.714E 00
2	2	106	1.000E 00	2.393E 01	1.357E 01	7.944E-01	2.874E 00	3.013E 01	1.763E 00	7.714E 00
2	3	107	1.000E 00	2.419E 01	1.378E 01	8.064E-01	2.921E 00	3.000E 01	1.756E 00	7.682E 00
2	4	108	1.000E 00	2.084E 01	1.183E 01	6.923E-01	2.475E 00	3.010E 01	1.762E 00	7.708E 00
2	5	109	1.000E 00	2.400E 01	1.366E 01	7.997E-01	2.895E 00	3.001E 01	1.756E 00	7.684E 00
2	6	110	1.000E 00	2.414E 01	1.369E 01	8.013E-01	2.901E 00	3.013E 01	1.763E 00	7.714E 00
1	34	111	1.000E 00	2.420E 01	1.379E 01	8.071E-01	2.923E 00	2.998E 01	1.755E 00	7.678E 00
1	35	112	1.000E 00	2.452E 01	1.398E 01	8.184E-01	2.967E 00	2.996E 01	1.754E 00	7.672E 00
1	36	113	1.000E 00	2.458E 01	1.397E 01	8.178E-01	2.965E 00	3.006E 01	1.759E 00	7.698E 00
1	37	114	1.000E 00	2.440E 01	1.389E 01	8.132E-01	2.947E 00	3.001E 01	1.756E 00	7.684E 00
1	38	115	1.000E 00	2.436E 01	1.390E 01	8.133E-01	2.948E 00	2.995E 01	1.753E 00	7.668E 00
2	34	116	1.000E 00	2.436E 01	1.388E 01	8.123E-01	2.944E 00	2.998E 01	1.755E 00	7.678E 00
2	35	117	1.000E 00	2.472E 01	1.410E 01	8.251E-01	2.994E 00	2.996E 01	1.754E 00	7.672E 00
2	36	118	1.000E 00	2.465E 01	1.401E 01	8.199E-01	2.973E 00	3.006E 01	1.759E 00	7.698E 00
2	37	119	1.000E 00	2.459E 01	1.400E 01	8.194E-01	2.971E 00	3.001E 01	1.756E 00	7.684E 00
2	38	120	1.000E 00	2.450E 01	1.398E 01	8.180E-01	2.966E 00	2.995E 01	1.753E 00	7.668E 00

b. Primary Performance Data, Sheet 2

Figure 19 Continued

PAGE NUMBER 3 GROUP 1001

DATE 5 27 70

VALUE	PORT	TAP	X/L	P	P/PINF	P/PO	CP	PO	PINF	QINF
1	12	121	1.000E 00	2.422E 01	1.375E 01	8.049E-01	2.915E 00	3.009E 01	1.761E 00	7.704E 00
1	13	122	1.000E 00	2.438E 01	1.389E 01	8.132E-01	2.947E 00	2.998E 01	1.755E 00	7.678E 00
1	14	123	1.000E 00	2.460E 01	1.398E 01	8.182E-01	2.967E 00	3.006E 01	1.759E 00	7.698E 00
1	15	124	1.000E 00	2.443E 01	1.389E 01	8.128E-01	2.946E 00	3.005E 01	1.759E 00	7.696E 00
1	16	125	1.000E 00	2.433E 01	1.379E 01	8.069E-01	2.923E 00	3.015E 01	1.765E 00	7.720E 00
2	12	126	1.000E 00	2.376E 01	1.350E 01	7.899E-01	2.856E 00	3.009E 01	1.761E 00	7.704E 00
2	13	127	1.000E 00	2.375E 01	1.353E 01	7.921E-01	2.865E 00	2.998E 01	1.755E 00	7.678E 00
2	14	128	1.000E 00	2.375E 01	1.350E 01	7.900E-01	2.857E 00	3.006E 01	1.759E 00	7.698E 00
2	15	129	1.000E 00	2.393E 01	1.360E 01	7.962E-01	2.881E 00	3.005E 01	1.759E 00	7.696E 00
2	16	130	1.000E 00	2.404E 01	1.363E 01	7.975E-01	2.886E 00	3.015E 01	1.765E 00	7.720E 00
1	17	131	1.000E 00	2.307E 01	1.311E 01	7.675E-01	2.769E 00	3.005E 01	1.759E 00	7.696E 00
2	17	132	1.000E 00	2.299E 01	1.307E 01	7.651E-01	2.759E 00	3.005E 01	1.759E 00	7.696E 00
1	0	135	0	2.303E 01	1.306E 01	7.642E-01	2.756E 00	3.013E 01	1.764E 00	7.716E 00
2	18	136	0	2.296E 01	1.303E 01	7.627E-01	2.750E 00	3.011E 01	1.762E 00	7.710E 00
1	19	137	0	2.317E 01	1.317E 01	7.706E-01	2.781E 00	3.007E 01	1.760E 00	7.700E 00
2	19	138	0	2.319E 01	1.318E 01	7.712E-01	2.783E 00	3.007E 01	1.760E 00	7.700E 00
1	0	139	0	1.512E 01	8.574E 00	5.018E-01	1.731E 00	3.013E 01	1.764E 00	7.716E 00
2	20	140	0	6.340E 00	3.613E 00	2.114E-01	5.971E-01	2.998E 01	1.755E 00	7.678E 00
2	1	143	0	3.431E 00	1.945E 00	1.139E-01	2.161E-01	3.013E 01	1.764E 00	7.716E 00
1	18	200	0	9.729E 00	5.521E 00	3.231E-01	1.033E 00	3.011E 01	1.762E 00	7.710E 00
1	20	201	0	5.443E 00	3.102E 00	1.815E-01	4.804E-01	2.998E 01	1.755E 00	7.678E 00
1	21	1	0	3.912E 00	2.222E 00	1.300E-01	2.793E-01	3.009E 01	1.761E 00	7.704E 00
2	21	1	0	3.897E 00	2.213E 00	1.295E-01	2.773E-01	3.009E 01	1.761E 00	7.704E 00

c. Primary Performance Data, Sheet 3

Figure 19 Continued

DATE 5-27-70

AEDC(ARO,INC.)ARNOLD AFS, TENNESSEE
VON KARMAN GAS DYNAMICS FACILITY
GAS DYNAMIC WIND TUNNEL, SUPERSONIC (A)

PAGE NUMBER ONE

GROUP	CONFIG	PROJECT	ALPHA-M	ALPHA-M1	ALPHA-M2	BETA-M1	BETA-M2	DEL 2	MBX	TBX
1002	1	VA0926	.010	.190	.190	0	0	17.200	.791	.340

MC	T-INF	P-INF	Q-INF	V-INF	RHO-INF	MU-INF	RE/FT	MACH NO	TO
15.02	2.502E 02	1.755E 00	7.680E 00	1.939E 03	5.885E-04	2.002E-07	5.698E 00	2.50	5.630E 02

Z	P50	P51	P52	P53	P54	RMS 11	RMS 12	RMS 13	RMS 14	(RMST)AVG
-4.870E-01	2.360E 01	2.342E 01	2.324E 01	2.315E 01	2.330E 01	1.826E-01	1.576E-02	9.273E-01	2.792E-02	9.273E-01
-1.115E 00	2.442E 01	2.422E 01	2.430E 01	2.395E 01	2.414E 01	1.864E-01	1.494E-02	1.095E 00	3.000E-02	1.095E 00
-1.764E 00	2.501E 01	2.503E 01	2.523E 01	2.470E 01	2.465E 01	1.874E-01	1.677E-02	7.406E-01	3.349E-02	7.406E-01
-2.441E 00	2.561E 01	2.464E 01	2.455E 01	2.461E 01	2.510E 01	1.855E-01	1.366E-02	3.861E-01	2.741E-02	3.861E-01
-3.126E 00	2.641E 01	2.508E 01	2.465E 01	2.495E 01	2.604E 01	1.859E-01	1.601E-02	1.886E-01	2.678E-02	1.886E-01

Z	P50/PO	P51/PO	P52/PO	P53/PO	P54/PO	PAVG/PO	*CFDEL	PO
-4.870E-01	7.868E-01	7.807E-01	7.748E-01	7.720E-01	7.769E-01	7.782E-01	1.000E 00	2.999E 01
-1.115E 00	8.112E-01	8.044E-01	8.072E-01	7.953E-01	8.016E-01	8.039E-01	1.086E 00	3.011E 01
-1.764E 00	8.313E-01	8.319E-01	8.386E-01	8.209E-01	8.193E-01	8.284E-01	1.089E 00	3.009E 01
-2.441E 00	8.467E-01	8.146E-01	8.119E-01	8.136E-01	8.299E-01	8.234E-01	1.081E 00	3.024E 01
-3.126E 00	8.702E-01	8.264E-01	8.121E-01	8.220E-01	8.579E-01	8.377E-01	1.082E 00	3.035E 01

TRR	DIT	(RMST)OAVG/TRR*PUAVG
8.143E-01	1.200E-01	2.718E-02

d. Movable Rake Data

Figure 19 Concluded

DATE 5/14/70 PROJ. NO. PL-C029
GROUP 3 ARO,INC.
ARNOLD AIR FORCE STATION,TENN

TEST	PART	POINT	TIME	DATE	DATA SET	DAY	AEDC PROPULSION WIND TUNNEL TRANSONIC 4T
TC- 60	293	2	1243	5-14-70	2	121	

PT	PT1	Q1	F1	RX10-6	PTA-1	PTB-2	PCA-1	PCB-2	PE	TTA-1	TTB-2	TH-W	TAU-T	TAU-B	TAU-S	TAU-N	TAUBR
1.2018	2166.2	901.0	851.2	4.402	2166.2	2163.1	900.9	899.6	1653.4	111.6	112.4	0.02	4.79	4.79	4.82	4.90	4.83

PC	TPR	ALFI	PHII	TEPC	PMC	SCX100	BT	BB	BS	BN
1.1935	1.3101	19.56	0.00	27.3	2057.4	0.311	0.426	0.425	0.423	0.416

ALF-D	ALF-M	EET-M	DEL-2	TBX	MBX	CF-AVE	DICF	WCF	WCF-COR	RMSCF	MFR-CF	P-REF	2DR
20.079	20.079	0.000	0.036	0.378	0.101	0.9869	0.02279	1.495	1.554	0.0030	0.3067	14.415	-0.031

WBT	WBR	WBS1	WO2DE	WC	MFR-ET	MFR-BR	MFR-BS1	MFR-O	CONF	INLET	YAW
0.1569	0.0000	0.0000	1.654	4.676	0.0726	0.0040	0.0000	0.3393	2	2DE	0.

PRMS1	PRMS2	PRMS3	PRMS4	PRMS5	PRMS6	PRMS7	PRMS8	PRMS9	PRMS10	PRMS11	PRMS14	PRMS15
0.0304	0.0552	0.0426	0.0426	0.0000	0.0262	0.0540	0.0000	0.0000	0.0081	0.0248	0.0000	0.0000

NRMS1	NRMS2	NRMS3	NRMS4	NRMS5	NRMS6	NRMS7	NRMS8	NRMS9	NRMS10	NRMS11	NRMS14	NRMS15
0.00205	0.00372	0.00287	0.00287	0.00000	0.00177	0.00364	0.00000	0.00000	0.00054	0.00167	0.00000	0.00000

a. Primary Performance Data, Sheet 1

Figure 20. Sample Tabulated Data Format - Uniform Flow Field, PWT-4T Tunnel, 2DE Inlet

DATE 5/14/70 PROJ. NO. PC-0029
GROUP 3 ARO, INC.
ARNOLD AIR FORCE STATION, TENN

TEST	PART	POINT	TIME	DATE	DATA SET	DAY
TC-080	293	2	1243	5/14/70	2	121

TAP	MODEL STA.	P	P/PTA	CP	TAP	MODEL STA.	P	P/PTA	CP
1	63.1	1753.8	0.6056	0.9574	90	85.0	1031.5	0.4762	0.1557
2	66.1	1747.1	0.6065	0.9500	91	85.0	2112.0	0.9750	1.3549
3	66.7	1839.2	0.6491	1.0522	92	85.0	2125.5	0.9817	1.3710
4	69.5	1945.3	0.6560	1.1496	93	85.0	2145.0	0.9902	1.3916
5	70.2	1997.8	0.9223	1.2282	94	85.0	2146.3	0.9908	1.3930
6	70.6	2001.4	0.9239	1.2322	95	85.0	2144.9	0.9902	1.3915
7	71.3	1991.9	0.9194	1.2217	100	98.9	2145.3	0.9917	1.3952
8	71.7	1979.8	0.9141	1.2082	101	100.0	2105.1	0.9718	1.3472
9	72.1	1836.6	0.8478	1.0492	102	100.0	2109.8	0.9740	1.3525
20	70.1	2058.3	0.9502	1.2953	103	100.0	2117.8	0.9777	1.3614
21	71.5	2076.6	0.9586	1.3156	104	100.0	2124.9	0.9810	1.3693
22	72.0	2081.9	0.9611	1.3215	105	100.0	2140.6	0.9882	1.3867
23	72.5	2088.9	0.9643	1.3293	106	100.0	2119.7	0.9786	1.3635
24	73.0	2090.4	0.9650	1.3310	107	100.0	2132.9	0.9846	1.3781
25	73.5	2089.3	0.9645	1.3297	108	100.0	2140.0	0.9879	1.3860
26	74.5	2078.3	0.9594	1.3175	109	100.0	2140.9	0.9883	1.3870
27	76.5	2069.9	0.9555	1.3082	110	100.0	2145.0	0.9902	1.3915
28	79.5	2060.6	0.9512	1.2978	111	100.0	2134.7	0.9854	1.3801
29	84.5	2064.5	0.9530	1.3022	112	100.0	2151.9	0.9934	1.3992
40	73.2	2091.2	0.9654	1.3319	113	100.0	2152.1	0.9935	1.3995
41	73.7	2055.7	0.9490	1.2924	114	100.0	2150.6	0.9928	1.3978
42	74.2	2050.2	0.9465	1.2864	115	100.0	2149.3	0.9922	1.3964
43	74.7	2050.1	0.9464	1.2862	116	100.0	2123.1	0.9801	1.3673
44	76.7	2051.1	0.9469	1.2873	117	100.0	2145.9	0.9906	1.3925
45	79.6	2066.6	0.9549	1.3067	118	100.0	0.0	0.0000	0.0000
46	84.6	2063.4	0.9525	1.3009	119	100.0	2153.8	0.9943	1.4013
47	92.5	2085.5	0.9628	1.3255	120	100.0	2150.8	0.9929	1.3988
48	98.0	2084.4	0.9623	1.3243	121	100.0	2133.6	0.9849	1.3789
60	71.0	595.4	0.4134	0.0047	122	100.0	2150.6	0.9928	1.3978
61	72.1	1341.9	0.6195	0.5002	123	100.0	2150.6	0.9928	1.3978
62	71.3	1444.2	0.6667	0.6137	124	100.0	2149.8	0.9924	1.3969
63	71.6	1449.5	0.6692	0.6196	125	100.0	2148.9	0.9920	1.3959
64	72.1	1417.7	0.6545	0.5844	126	100.0	2120.0	0.9787	1.3637
65	72.7	1276.0	0.5890	0.4270	127	100.0	2128.8	0.9827	1.3736
66	74.0	2166.2	1.0000	1.4151	128	100.0	2135.5	0.9858	1.3818
70	68.0	1972.3	0.9105	1.1999	129	100.0	2140.0	0.9879	1.3860
71	68.0	1999.1	0.9229	1.2297	130	100.0	2147.4	0.9913	1.3942
72	68.0	2109.4	0.9738	1.3520	131	100.0	2075.3	0.9580	1.3142
73	68.0	2148.9	0.9920	1.3959	132	100.0	1800.2	0.8310	1.0888
74	68.0	2151.3	0.9931	1.3985	135	105.2	0.0	0.0000	0.0000
75	68.0	2151.7	0.9933	1.3990	136	105.2	2075.7	0.9582	1.3146
80	70.0	2139.2	0.9875	1.3851	137	105.2	2076.1	0.9584	1.3151
81	70.0	2146.8	0.9910	1.3935	138	105.2	2075.3	0.9580	1.3142
82	70.0	2151.3	0.9931	1.3985	139	108.2	1372.4	0.6335	0.5348
83	70.0	2151.5	0.9932	1.3988	140	108.4	566.7	0.2715	-0.3358
84	70.0	2151.5	0.9932	1.3988	143	114.7	654.3	0.3944	-0.0418
85	70.0	0.0	0.0000	0.0000	200	74.0	1825.5	0.8427	1.0369
					201	78.0	1844.2	0.8514	1.0577

b. Primary Performance Data, Sheet 2

Figure 20 Continued

DATE 5/1/67 PROJ. NO. PC-0029
GROUP 3 ARO,INC.
ARNOLD AIR FORCE STATION,TENN

TRANSLATING RAKE

TEST	PART	M1	PT1	Q1	P1	ALFM	BETM
TC-080	294	1.2009	2166.2	900.7	892.3	20.073	0.000

POINT	TAP	P	P/PTA	CP	2DR	RK	RK-AVE	DIT	PRMS12	PRMS13	NRMS12	NRMS13	RMST	T-AVE
2	50	2110.9	0.9745	1.3530	0.527	0.9637	0.9838	0.0219	0.0750	0.0300	0.0051	0.0020	0.0035	0.0036
	51	2144.6	0.9901	1.3906										
	52	2150.8	0.9929	1.3973										
	53	2142.6	0.9892	1.3883										
	54	2104.6	0.9716	1.3460										
POINT	TAP	P	P/PTA	CP	2DR	RK	RK-AVE	DIT	PRMS12	PRMS13	NRMS12	NRMS13	RMST	T-AVE
3	50	2133.6	0.9850	1.3784	1.331	0.9900	0.9858	0.0218	0.0676	0.0273	0.0046	0.0018	0.0032	0.0034
	51	2151.1	0.9930	1.3978										
	52	2149.3	0.9922	1.3958										
	53	2149.5	0.9923	1.3960										
	54	2139.4	0.9876	1.3848										
POINT	TAP	P	P/PTA	CP	2DR	RK	RK-AVE	DIT	PRMS12	PRMS13	NRMS12	NRMS13	RMST	T-AVE
4	50	2138.6	0.9688	1.3873	2.134	0.9914	0.9872	0.0218	0.0561	0.0291	0.0038	0.0020	0.0029	0.0033
	51	2146.6	0.9924	1.3959										
	52	2146.1	0.9922	1.3954										
	53	2146.1	0.9922	1.3953										
	54	2144.6	0.9915	1.3927										
POINT	TAP	P	P/PTA	CP	2DR	RK	RK-AVE	DIT	PRMS12	PRMS13	NRMS12	NRMS13	RMST	T-AVE
5	50	2153.5	0.9926	1.3976	2.936	0.9931	0.9884	0.0220	0.0437	0.0285	0.0030	0.0019	0.0024	0.0031
	51	2154.3	0.9932	1.3985										
	52	2154.3	0.9932	1.3985										
	53	2154.5	0.9933	1.3987										
	54	2153.7	0.9929	1.3978										
POINT	TAP	P	P/PTA	CP	2DR	RK	RK-AVE	DIT	PRMS12	PRMS13	NRMS12	NRMS13	RMST	T-AVE
6	50	2160.8	0.9945	1.4010	3.758	0.9945	0.9894	0.0233	0.0479	0.0320	0.0032	0.0022	0.0027	0.0031
	51	2160.5	0.9944	1.4008										
	52	2160.3	0.9943	1.4005										
	53	2160.9	0.9946	1.4012										
	54	2160.5	0.9944	1.4008										

c. Movable Rake Data

Figure 20 Concluded

DATE 10 29 70

AEDC(ARO,INC.)ARNOLD AFS, TENNESSEE
VON KARMAN GAS DYNAMICS FACILITY
GAS DYNAMIC WIND TUNNEL, SUPERSONIC (A)

PAGE NUMBER ONE

GRP	CONFIG	PROJ	ALPM	ALP2	ALPM(CORR)	ALP2(CORR)	BETA M	BETA 2	PO AVG	TO
189	1	VA0154	0	.200	0	.200	0	0	2.386E 01	5.620E 02

TINF	PINF	QINF	VINF	RHOINF	MUINF	RE/FT	MACH NO	CR	XS	AC
3.122E 02	3.037E 00	6.505E 00	1.732E 03	8.161E-04	2.452E-07	5.766E 00	2.000	6.000E 01	2.006E 01	1.502E 01

CEL 2	MHA	TBR	CFR	DICF	(RMSCF)AVG	(WCF)CORR	YW	XM	YM	PS REF
1.130E 01	1.170E 00	3.490E-01	8.591E-01	1.160E-01	2.263E-02	2.377E 00	9.690E 00	-2.561E 01	-7.202E 00	4.016E 00
								XM2	YM2	
								-2.561E 01	-7.140E 00	

WCF	WBI	WBR	WBSI	WO	WC	WCF/WC	WBI/WC	WBR/WC	WBSI/WC	WO/WC
3.185E 00	1.911E-01	8.834E-02	0	3.464E 00	4.746E 00	6.709E-01	4.025E-02	1.861E-02	0	7.298E-01

RMS1	RMS2	RMS3	RMS4	RMS5	RMS6	RMS7	RMS8	RMS9	RMS10	RMS11	RMS14
5.126E-01	2.436E-01	3.334E-01	4.994E-01	5.540E-01	5.263E-01	4.750E-01	1.276E-01	1.105E-01	5.203E-03	1.410E-01	5.206E 00

RMS1/PTCF	RMS2/PTCF	RMS3/PTCF	RMS4/PTCF	RMS5/PTCF	RMS6/PTCF	RMS7/PTCF	RMS8/PTCF	RMS9/PTCF	RMS10/PTCF	RMS11/PTCF	RMS14/PTCF
2.501E-02	1.385E-02	1.624E-02	3.414E-02	2.703E-02	2.568E-02	2.317E-02	6.223E-03	5.391E-03	2.538E-04	6.910E-03	-5.957-261

VALUE	PLAT	TAP	X/L	P	P/PINF	P/PO	CP	PO	PINF	M1/MINF
1	7	1	-3.175E-01	5.603E 00	1.831E 00	2.340E-01	2.967E-01	2.394E 01	3.060E 00	
2	7	2	-2.096E-01	5.316E 00	1.737E 00	2.220E-01	2.633E-01	2.394E 01	3.060E 00	
1	8	3	-1.179E-01	9.138E 00	2.979E 00	3.808E-01	7.069E-01	2.400E 01	3.067E 00	
2	8	4	-9.107E-02	8.706E 00	2.839E 00	3.628E-01	6.567E-01	2.400E 01	3.067E 00	
1	9	5	-6.607E-02	1.079E 01	3.382E 00	4.323E-01	8.508E-01	2.381E 01	3.043E 00	
2	9	6	-5.000E-02	1.375E 01	4.518E 00	5.774E-01	1.256E 00	2.381E 01	3.043E 00	
1	10	7	-2.429E-02	1.321E 01	4.338E 00	5.544E-01	1.192E 00	2.383E 01	3.045E 00	
6	8	8	-1.214E-02	1.278E 01	4.208E 00	5.378E-01	1.146E 00	2.377E 01	3.037E 00	
7	0	9	1.790E-03	7.911E 00	2.605E 00	3.329E-01	5.731E-01	2.377E 01	3.037E 00	
8	0	20	-3.357E-02	1.629E 01	5.364E 00	6.856E-01	1.559E 00	2.377E 01	3.037E 00	
2	25	21	-1.786E-02	1.635E 01	5.377E 00	6.872E-01	1.563E 00	2.379E 01	3.040E 00	
2	26	22	0	1.664E 01	5.448E 00	6.963E-01	1.589E 00	2.390E 01	3.054E 00	
2	27	23	1.679E-02	1.743E 01	5.710E 00	7.298E-01	1.682E 00	2.389E 01	3.053E 00	
2	28	24	3.393E-02	1.759E 01	5.793E 00	7.404E-01	1.712E 00	2.375E 01	3.035E 00	
2	29	25	5.179E-02	1.775E 01	5.828E 00	7.448E-01	1.724E 00	2.384E 01	3.046E 00	
2	30	26	6.750E-02	1.773E 01	5.776E 00	7.382E-01	1.706E 00	2.401E 01	3.069E 00	
2	31	27	1.607E-01	1.766E 01	5.757E 00	7.358E-01	1.699E 00	2.400E 01	3.067E 00	
2	32	28	2.679E-01	1.768E 01	5.814E 00	7.430E-01	1.719E 00	2.379E 01	3.040E 00	
2	33	29	4.464E-01	1.832E 01	5.994E 00	7.661E-01	1.784E 00	2.391E 01	3.056E 00	
1	25	40	4.107E-02	1.854E 01	6.097E 00	7.792E-01	1.820E 00	2.379E 01	3.040E 00	
1	26	41	5.893E-02	1.673E 01	5.477E 00	7.000E-01	1.599E 00	2.390E 01	3.054E 00	
1	27	42	7.679E-02	1.665E 01	5.454E 00	6.971E-01	1.591E 00	2.389E 01	3.053E 00	
1	28	43	9.500E-02	1.673E 01	5.510E 00	7.043E-01	1.611E 00	2.375E 01	3.035E 00	
1	29	44	1.679E-01	1.700E 01	5.581E 00	7.133E-01	1.636E 00	2.384E 01	3.046E 00	
1	30	45	2.718E-01	1.759E 01	5.731E 00	7.324E-01	1.690E 00	2.401E 01	3.069E 00	

a. Primary Performance Data, Sheet 1

Figure 21. Sample Tabulated Data Format - Uniform/Nonuniform Flow Field, VKF-A Tunnel, 2DE Inlet

PAGE NUMBER 2 GROUP 189

DATE 10 29 70

VALUE	PCNT	TAP	X/L	P	P/PINF	P/PO	CP	PO	PINF	MI/MINF
1	31	46	4.500E-01	1.822E 01	5.940E 00	7.592E-01	1.764E 00	2.400E 01	3.067E 00	
1	32	47	7.321E-01	1.897E 01	6.240E 00	7.975E-01	1.871E 00	2.379E 01	3.040E 00	
1	1	48	9.286E-01	8.394E 00	2.763E 00	3.532E-01	6.298E-01	2.377E 01	3.037E 00	
1	42	70	0	1.322E 01	4.305E 00	5.502E-01	1.180E 00	2.404E 01	3.072E 00	
1	43	71	0	1.488E 01	4.902E 00	6.265E-01	1.394E 00	2.375E 01	3.035E 00	
1	44	72	0	2.029E 01	6.685E 00	8.543E-01	2.030E 00	2.375E 01	3.035E 00	
1	45	73	0	2.192E 01	7.176E 00	9.171E-01	2.206E 00	2.390E 01	3.054E 00	
1	46	74	0	2.196E 01	7.193E 00	9.193E-01	2.212E 00	2.389E 01	3.053E 00	
1	47	75	0	2.184E 01	7.179E 00	9.176E-01	2.207E 00	2.380E 01	3.042E 00	
2	42	80	0	1.854E 01	6.037E 00	7.715E-01	1.799E 00	2.404E 01	3.072E 00	
2	43	81	0	6.894E 00	2.271E 00	2.903E-01	4.540E-01	2.375E 01	3.035E 00	
2	44	82	0	2.114E 01	6.966E 00	8.903E-01	2.131E 00	2.375E 01	3.035E 00	
2	45	83	0	2.150E 01	7.038E 00	8.995E-01	2.156E 00	2.390E 01	3.054E 00	
2	46	84	0	2.152E 01	7.050E 00	9.010E-01	2.161E 00	2.389E 01	3.053E 00	
2	47	85	0	1.790E 01	5.884E 00	7.521E-01	1.744E 00	2.380E 01	3.042E 00	
1	22	90	0	1.946E 01	6.374E 00	8.146E-01	1.919E 00	2.389E 01	3.053E 00	
2	22	91	0	1.956E 01	6.405E 00	8.186E-01	1.930E 00	2.389E 01	3.053E 00	
1	23	92	0	1.951E 01	6.364E 00	8.133E-01	1.916E 00	2.399E 01	3.066E 00	
2	23	93	0	1.934E 01	6.306E 00	8.060E-01	1.895E 00	2.399E 01	3.066E 00	
1	24	94	0	1.909E 01	6.270E 00	8.013E-01	1.882E 00	2.382E 01	3.044E 00	
2	24	95	0	1.898E 01	6.236E 00	7.970E-01	1.870E 00	2.382E 01	3.044E 00	
2	11	100	9.604E-01	2.034E 01	6.645E 00	8.493E-01	2.016E 00	2.395E 01	3.061E 00	
1	2	101	1.000E 00	1.959E 01	6.453E 00	8.247E-01	1.947E 00	2.375E 01	3.035E 00	
1	3	102	1.000E 00	1.959E 01	6.405E 00	8.185E-01	1.930E 00	2.394E 01	3.059E 00	
1	4	103	1.000E 00	1.960E 01	6.404E 00	8.185E-01	1.930E 00	2.395E 01	3.061E 00	
1	5	104	1.000E 00	1.959E 01	6.419E 00	8.204E-01	1.935E 00	2.388E 01	3.052E 00	
1	6	105	1.000E 00	1.997E 01	6.555E 00	8.378E-01	1.984E 00	2.384E 01	3.046E 00	
2	2	106	1.000E 00	1.953E 01	6.433E 00	8.222E-01	1.940E 00	2.375E 01	3.035E 00	
2	3	107	1.000E 00	1.959E 01	6.402E 00	8.183E-01	1.929E 00	2.394E 01	3.059E 00	
2	4	108	1.000E 00	1.968E 01	6.430E 00	8.218E-01	1.939E 00	2.395E 01	3.061E 00	
2	5	109	1.000E 00	1.983E 01	6.498E 00	8.305E-01	1.964E 00	2.388E 01	3.052E 00	
2	6	110	1.000E 00	2.018E 01	6.623E 00	8.465E-01	2.008E 00	2.384E 01	3.046E 00	
1	12	111	1.000E 00	2.017E 01	6.591E 00	8.423E-01	1.997E 00	2.395E 01	3.061E 00	
1	13	112	1.000E 00	2.054E 01	6.743E 00	8.618E-01	2.051E 00	2.383E 01	3.045E 00	
1	14	113	1.000E 00	2.096E 01	6.886E 00	8.801E-01	2.102E 00	2.381E 01	3.043E 00	
1	15	114	1.000E 00	2.099E 01	6.896E 00	8.813E-01	2.106E 00	2.382E 01	3.044E 00	
1	16	115	1.000E 00	2.105E 01	6.918E 00	8.841E-01	2.114E 00	2.381E 01	3.043E 00	
2	12	116	1.000E 00	2.032E 01	6.636E 00	8.482E-01	2.013E 00	2.395E 01	3.061E 00	
2	13	117	1.000E 00	2.046E 01	6.883E 00	8.796E-01	2.101E 00	2.383E 01	3.045E 00	
2	14	118	1.000E 00	2.149E 01	7.060E 00	9.023E-01	2.164E 00	2.381E 01	3.043E 00	
2	15	119	1.000E 00	2.182E 01	7.167E 00	9.160E-01	2.203E 00	2.382E 01	3.044E 00	
2	16	120	1.000E 00	2.132E 01	7.006E 00	8.954E-01	2.145E 00	2.381E 01	3.043E 00	
1	34	121	1.000E 00	2.093E 01	6.860E 00	8.768E-01	2.093E 00	2.387E 01	3.051E 00	
1	35	122	1.000E 00	2.165E 01	7.101E 00	9.076E-01	2.179E 00	2.385E 01	3.048E 00	
1	36	123	1.000E 00	2.185E 01	7.182E 00	9.179E-01	2.208E 00	2.380E 01	3.042E 00	
1	37	124	1.000E 00	2.149E 01	7.054E 00	9.015E-01	2.162E 00	2.384E 01	3.046E 00	
1	38	125	1.000E 00	2.106E 01	6.883E 00	8.797E-01	2.101E 00	2.394E 01	3.059E 00	
2	34	126	1.000E 00	2.011E 01	6.592E 00	8.425E-01	1.997E 00	2.387E 01	3.051E 00	
2	35	127	1.000E 00	2.026E 01	6.646E 00	8.493E-01	2.016E 00	2.385E 01	3.048E 00	

b. Primary Performance Data, Sheet 2

Figure 21 Continued

PAGE NUMBER 3 GROUP 189

DATE 10 29 70

VALUE	PORT	TAP	X/L	P	P/PINF	P/PO	CP	PO	PINF	MI/MINF
2	36	128	1.000E 00	2.033E 01	6.683E 00	8.542E-01	2.030E 00	2.380E 01	3.042E 00	
2	37	129	1.000E 00	2.021E 01	6.635E 00	8.480E-01	2.013E 00	2.384E 01	3.046E 00	
2	38	130	1.000E 00	2.024E 01	6.615E 00	8.454E-01	2.005E 00	2.394E 01	3.059E 00	
1	17	131	1.000E 00	1.882E 01	6.204E 00	7.926E-01	1.858E 00	2.374E 01	3.034E 00	
2	17	132	1.000E 00	1.886E 01	6.217E 00	7.945E-01	1.863E 00	2.374E 01	3.034E 00	
1	19	135	0	1.860E 01	6.086E 00	7.779E-01	1.817E 00	2.391E 01	3.056E 00	
2	19	136	0	1.679E 01	6.148E 00	7.858E-01	1.839E 00	2.391E 01	3.056E 00	
1	20	137	0	1.874E 01	6.140E 00	7.847E-01	1.836E 00	2.388E 01	3.052E 00	
2	20	138	0	1.854E 01	6.075E 00	7.764E-01	1.813E 00	2.388E 01	3.052E 00	
2	10	139	0	1.203E 01	3.950E 00	5.048E-01	1.053E 00	2.383E 01	3.045E 00	
1	11	140	0	5.161E 00	1.686E 00	2.155E-01	2.450E-01	2.395E 01	3.061E 00	
2	1	143	0	3.160E 00	1.040E 00	1.330E-01	1.445E-02	2.377E 01	3.037E 00	
1	18	200	0	7.763E 00	2.556E 00	3.266E-01	5.556E-01	2.377E 01	3.037E 00	
2	18	201	0	6.730E 00	2.216E 00	2.832E-01	4.342E-01	2.377E 01	3.037E 00	
3	2	301	0	5.013E 00	1.652E 00	2.111E-01	2.327E-01	2.375E 01	3.035E 00	
3	3	302	0	5.022E 00	1.642E 00	2.098E-01	2.291E-01	2.394E 01	3.059E 00	
3	4	303	0	5.073E 00	1.657E 00	2.118E-01	2.347E-01	2.395E 01	3.061E 00	
3	5	304	0	4.975E 00	1.630E 00	2.083E-01	2.250E-01	2.388E 01	3.052E 00	
3	6	340	0	5.046E 00	1.657E 00	2.117E-01	2.345E-01	2.384E 01	3.046E 00	
1	39	210	0	1.920E 01	6.321E 00	8.076E-01	1.900E 00	2.377E 01	3.037E 00	8.950E-01
2	39	211	0	1.862E 01	6.130E 00	7.834E-01	1.832E 00	2.377E 01	3.037E 00	9.250E-01
1	40	212	0	1.801E 01	5.930E 00	7.579E-01	1.761E 00	2.377E 01	3.037E 00	9.500E-01
2	40	213	0	1.749E 01	5.757E 00	7.358E-01	1.699E 00	2.377E 01	3.037E 00	9.750E-01
1	41	214	0	1.656E 01	5.407E 00	6.910E-01	1.574E 00	2.396E 01	3.062E 00	1.020E 00
2	41	215	0	1.558E 01	5.088E 00	6.503E-01	1.460E 00	2.396E 01	3.062E 00	1.060E 00
3	7	216	0	1.453E 01	4.750E 00	6.070E-01	1.339E 00	2.394E 01	3.060E 00	1.110E 00
3	8	217	0	1.450E 01	4.727E 00	6.042E-01	1.331E 00	2.400E 01	3.067E 00	1.110E 00
3	9	218	0	1.455E 01	4.762E 00	6.112E-01	1.351E 00	2.381E 01	3.043E 00	1.110E 00
3	10	219	0	1.394E 01	4.545E 00	5.809E-01	1.266E 00	2.383E 01	3.045E 00	1.145E 00
3	11	220	0	1.451E 01	4.741E 00	6.060E-01	1.336E 00	2.395E 01	3.061E 00	1.110E 00
3	13	0	0	1.418E 01	4.658E 00	5.953E-01	1.306E 00	2.383E 01	3.045E 00	
1	21	0	0	4.004E 00	1.312E 00	1.677E-01	1.116E-01	2.387E 01	3.051E 00	
2	21	0	0	3.976E 00	1.303E 00	1.665E-01	1.082E-01	2.387E 01	3.051E 00	

c. Primary Performance Data, Sheet 3

Figure 21 Continued

DATE 10 29 70

AEDC(ARO,INC.)ARNOLD AFS, TENNESSEE
VON KARMAN GAS DYNAMICS FACILITY
GAS DYNAMIC WIND TUNNEL, SUPERSONIC (A)

PAGE NUMBER ONE

GRP	CONFIG	PROJ	ALPM	ALP2	ALPM(CORR)	ALP2(CORR)	BETA M	BETA 2	PO AVG	TO
150	1	VA0154	0	.200	0	.200	0	0	2.384E 01	5.620E 02

TINF	PINF	UINF	VINF	RHOINF	MUINF	RE/FT	MACH NO	CR	KS	AC
3.122E 02	3.059E 00	8.596E 00	1.732E 03	8.220E-04	2.452E-07	5.808E 00	2.000	6.000E 01	2.806E 01	1.502E 01

DEL 2	MCR	TBA	YM	XM	YM	XM2	YM2
1.138E 01	1.170E 00	3.449E-01	9.690E 00	-2.561E 01	-7.202E 00	-2.561E 01	-7.148E 00

Z	PS0	PS1	PS2	PS3	PS4	RMS 12	RMS 13	(RMST)AVG
-4.940E-01	1.980E 01	1.890E 01	1.858E 01	1.884E 01	1.908E 01	8.342E-01	5.704E-01	7.063E-01
-1.177E 00	2.085E 01	1.934E 01	1.941E 01	1.948E 01	1.990E 01	8.365E-01	8.801E-01	8.583E-01
-1.900E 00	2.178E 01	2.135E 01	2.126E 01	2.096E 01	2.127E 01	5.466E-01	7.583E-01	6.524E-01
-2.618E 00	2.225E 01	2.212E 01	2.189E 01	2.170E 01	2.223E 01	3.334E-01	2.648E-01	2.991E-01
-3.338E 00	2.251E 01	2.242E 01	2.222E 01	2.202E 01	2.226E 01	2.381E-01	1.992E-01	2.187E-01

Z	PS0/PO	PS1/PO	PS2/PO	PS3/PO	PS4/PO	PAVG/PO	PO
-4.940E-01	8.290E-01	7.890E-01	7.764E-01	7.873E-01	7.972E-01	7.960E-01	2.394E 01
-1.177E 00	8.711E-01	8.080E-01	8.108E-01	8.137E-01	8.313E-01	8.270E-01	2.394E 01
-1.900E 00	9.170E-01	8.992E-01	8.953E-01	8.826E-01	8.955E-01	8.979E-01	2.375E 01
-2.618E 00	9.339E-01	9.283E-01	9.185E-01	9.107E-01	9.330E-01	9.249E-01	2.383E 01
-3.338E 00	9.474E-01	9.436E-01	9.353E-01	9.270E-01	9.371E-01	9.381E-01	2.376E 01

TRR	UIT	(RMST)UAVG/TRR*PUAVG
8.768E-01	1.951E-01	2.617E-02

d. Movable Rake Data

Figure 21 Concluded

10 29 70

AEDC(ARO,INC.)ARNOLD AFS, TENNESSEE
VON KARMAN GAS DYNAMICS FACILITY
GAS DYNAMIC WIND TUNNEL, SUPERSONIC (A)

PAGE NUMBER ONE

GRP	CONFIG	PROJ	MACH	RE/FT	TO	YM
174	WELGE	VA0154	2.000	5.801E 00	5.620E 02	5.000E 00

TINF	PINF	QINF	VINF	RHOINF	MUINF
1.122E 02	3.056E 00	8.557E 00	1.732E 03	8.211E-04	2.452E-07

VALUE	PCNT	TAP	P	P/PINF	P/PO	PO	PINF	MI/MINF	MI
3	6	340	4.837E 00	1.599E 00	2.030E-01	2.383E 01	3.045E 00		
3	2	341	4.940E 00	1.620E 00	2.070E-01	2.386E 01	3.050E 00		
3	3	342	4.826E 00	1.583E 00	2.023E-01	2.386E 01	3.049E 00		
3	4	343	4.920E 00	1.609E 00	2.056E-01	2.393E 01	3.058E 00		
3	5	344	4.933E 00	1.623E 00	2.074E-01	2.379E 01	3.040E 00		
3	12	300	1.946E 01	6.369E 00	8.139E-01	2.391E 01	3.056E 00	8.900E-01	1.700E 00
3	13	301	1.886E 01	6.233E 00	7.966E-01	2.368E 01	3.026E 00	9.150E-01	1.830E 00
3	14	302	1.813E 01	5.943E 00	7.595E-01	2.387E 01	3.051E 00	9.500E-01	1.900E 00
3	15	303	1.722E 01	5.642E 00	7.210E-01	2.389E 01	3.053E 00	9.900E-01	1.980E 00
3	16	304	1.610E 01	5.321E 00	6.800E-01	2.388E 01	3.020E 00	1.045E 00	2.090E 00
3	17	305	1.492E 01	4.916E 00	6.283E-01	2.375E 01	3.035E 00	1.095E 00	2.190E 00
3	18	306	1.398E 01	4.609E 00	5.891E-01	2.373E 01	3.032E 00	1.140E 00	2.280E 00
3	19	307	1.954E 01	6.442E 00	8.233E-01	2.385E 01	3.040E 00	8.800E-01	1.760E 00
3	20	308	1.892E 01	6.175E 00	7.892E-01	2.397E 01	3.064E 00	9.150E-01	1.830E 00
3	21	0	4.029E 00	1.327E 00	1.697E-01	2.375E 01	3.035E 00		
3	22	309	1.821E 01	6.002E 00	7.671E-01	2.374E 01	3.034E 00	9.450E-01	1.890E 00
3	23	310	1.730E 01	5.645E 00	7.215E-01	2.397E 01	3.064E 00	9.900E-01	1.900E 00
3	24	311	1.616E 01	5.285E 00	6.754E-01	2.392E 01	3.057E 00	1.040E 00	2.000E 00
3	25	312	1.486E 01	4.861E 00	6.212E-01	2.392E 01	3.057E 00	1.100E 00	2.200E 00
3	26	313	1.389E 01	4.555E 00	5.821E-01	2.386E 01	3.050E 00	1.145E 00	2.290E 00
3	27	314	1.952E 01	6.430E 00	8.226E-01	2.373E 01	3.032E 00	8.850E-01	1.770E 00
3	28	315	1.907E 01	6.254E 00	7.993E-01	2.386E 01	3.049E 00	9.050E-01	1.810E 00
3	29	316	1.825E 01	5.968E 00	7.627E-01	2.393E 01	3.058E 00	9.450E-01	1.890E 00
3	30	317	1.736E 01	5.698E 00	7.282E-01	2.384E 01	3.047E 00	9.650E-01	1.970E 00
3	31	318	1.623E 01	5.293E 00	6.764E-01	2.399E 01	3.066E 00	1.035E 00	2.070E 00
3	32	319	1.497E 01	4.891E 00	6.251E-01	2.395E 01	3.061E 00	1.095E 00	2.190E 00
3	33	320	1.405E 01	4.596E 00	5.862E-01	2.397E 01	3.064E 00	1.135E 00	2.270E 00
3	34	321	1.962E 01	6.422E 00	8.208E-01	2.390E 01	3.055E 00	8.800E-01	1.760E 00
3	35	322	1.881E 01	6.169E 00	7.884E-01	2.386E 01	3.049E 00	9.200E-01	1.840E 00
3	36	323	1.819E 01	5.914E 00	7.559E-01	2.406E 01	3.075E 00	9.500E-01	1.900E 00
3	37	324	1.760E 01	5.730E 00	7.324E-01	2.403E 01	3.071E 00	9.750E-01	1.950E 00
3	38	325	1.627E 01	5.298E 00	6.770E-01	2.404E 01	3.072E 00	1.035E 00	2.070E 00
3	39	326	1.499E 01	4.923E 00	6.292E-01	2.383E 01	3.045E 00	1.095E 00	2.190E 00
3	40	327	1.407E 01	4.601E 00	5.880E-01	2.393E 01	3.058E 00	1.135E 00	2.270E 00
3	41	328	1.964E 01	6.372E 00	8.144E-01	2.412E 01	3.083E 00	8.800E-01	1.760E 00
3	42	329	1.908E 01	6.223E 00	7.953E-01	2.399E 01	3.066E 00	9.050E-01	1.810E 00
3	43	330	1.816E 01	5.924E 00	7.571E-01	2.399E 01	3.066E 00	9.500E-01	1.900E 00
3	44	331	1.734E 01	5.629E 00	7.195E-01	2.410E 01	3.080E 00	9.850E-01	1.970E 00
3	45	332	1.637E 01	5.358E 00	6.847E-01	2.391E 01	3.056E 00	1.030E 00	2.060E 00
3	46	333	1.501E 01	4.877E 00	6.233E-01	2.407E 01	3.077E 00	1.095E 00	2.190E 00
3	1	334	1.387E 01	4.539E 00	5.802E-01	2.391E 01	3.056E 00	1.145E 00	2.290E 00

Figure 22. Sample Tabulated Data Format – Flow Field Calibration

REFERENCES

1. Butler, R.W., "Transonic Performance of Supersonic Two-Dimensional External-Compression and Half-Axisymmetric Inlets," AEDC-TR-70-186, July 1970.

2. Hube, F.K., Jenke, L.M., "Wind Tunnel Tests of Two-Dimensional and Half-Axisymmetric Inlet Models at Mach Numbers 1.5 through 3.0," AEDC-TR-70-280, December 1970.

3. Hube, F.K., Jenke, L.M., "Wind Tunnel Tests of Supersonic Two-Dimensional and Half-Axisymmetric Inlet Models in a Nonuniform Flow Field at Mach Numbers from 1.5 through 2.5," AEDC-TR-71-107, May 1971.

APPENDIX: SUPERSONIC INLET INVESTIGATION TABULATED DATA

APPENDIX

SUPERSONIC INLET INVESTIGATION TABULATED DATA

The microfilm tabulated data may be obtained from the Air Force Flight Dynamics Laboratory upon request. The microfilm data is classified CONFIDENTIAL, Group 4.

Address all requests as follows:

Air Force Flight Dynamics Laboratory
Attn: FXM Donald J. Stava
Contract: F33615-69-C-1699
Wright-Patterson Air Force Base, Ohio 45433

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13. ABSTRACT

Presented herein are wind tunnel data from an investigation whose primary objective was to develop design criteria and performance tradeoffs for supersonic inlets applicable to advanced tactical aircraft. The objective was accomplished by conducting analysis and wind tunnel tests using approximately .125 scale model air induction systems. The baseline models included a two-dimensional external compression inlet, a half-axisymmetric external compression inlet, and a two-dimensional mixed compression inlet. Alternate configurations for the external compression baseline inlets were also investigated. Tests were conducted at transonic and supersonic Mach numbers in the AEDC PWT-4T and VKF-A wind tunnels, respectively. The inlets were tested both isolated and in a well defined nonuniform flow field, the latter representing partial simulation of a vehicle flow field. Steady state performance data (i.e., pressure recovery, pressure distortion, and turbulence levels) are provided at a simulated compressor face and immediately downstream of the inlet throat for the various inlet configurations tested. Additional diagnostic data are provided in the way of surface pressures and boundary layer pressures on the inlet compression surfaces and in the subsonic diffusers.

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